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ABSTRACT

Because many pesticides are potentially injurious to their users and can have a deleterious effect on the environment when misused, the Environmental Protection Agency has restricted the use of some chemicals to certified users only. A program was developed to assess the need for training in pesticide use, to develop the necessary curriculum, to conduct a pilot training program, and to assess the results and the costs. Four instructional delivery systems (conventional reading, slide-tape, printed/programed, and audio-assisted) were developed to teach a curriculum centered around: (1) common pests, (2) label reading, (3) calibration, (4) environmental considerations, and (5) basic safety. Effectiveness Tests were statistically analyzed, and the audio-assisted method was shown to be significantly inferior to the other three methods. A discussion of the research methodology and statistical results are provided, and the appendix includes extensive samples of the experiemntal curricula. (EMH)

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A Comparative Analysis of Four Individualized Instructional Delivery Systems with Adult Learners

United States Environmental Protection
Agency Contract No. 68-01-2910
Acquisition of Information
To be Used in Programing
for Pesticide Application
Certification Training

1975

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EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U.S. DEPARTMENT OF AGRICULTURE
LEO E. LUCAS, DIRECTOR

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December, 1975

Final Report

A Comparative Analysis of Four Individualized Instructional Delivery Systems with Adult Learners

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PREFACE

This study entitled, "A Comparative Analysis of Four Individualized Instructional Methods with Adult Learners" was conducted at the University of Nebraska-Lincoln by staff members of the Cooperative Extension Service. It was supported by a grant from the United States Environmental Protection Agency, Contract No. 68-01-2910 Acquisition of Information to be used in Programing for Pesticide Application Certification Training.

The project was initiated in July of 1974. The information gathering phase was concluded in March of 1975. The project was directed by Robert J. Florell, State Leader, Studies and Training, Cooperative Extension Service, University of Nebraska-Lincoln. Ida Holzbauer served as research assistant and primary author for the project. She assisted in all phases of the study and handled the tabulation and analysis of the data.

The data were collected from a group of 203 Nebraska farmers who were invited to participate by County Extension Agents in ten counties in the state. The efforts of the Extension Agents were crucial to the collection of data and the ultimate success of the project.

Robert E. Roselle served as the primary content consultant and also assisted with other details of the project. Other persons also made valuable contributions to the project. The instructional materials and evaluation instruments were tested

in Dr. Z. B. Mayo's Entomology class. The Nebraska farmers who participated in the project studied assigned individualized instructional methods and completed evaluation instruments as requested.

The draft of the final report was submitted to the United States Environmental Protection Agency and to a reading committee consisting of Dr. Richard Lorah, Coordinator, Community Resource Development, Cooperative Extension Service, University of Nebraska-Lincoln, and Dr. Roger H. Bruning, Associate Professor, Educational Psychology and Measurements, University of Nebraska-Lincoln.

The authors appreciated the guidance and advice of William Hoffman, Project Officer, U. S. Environmental Protection Agency, as well as the cooperation and assistance of all individuals who were involved with the project.

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CHAPTER I

Introduction

Background[1]

"1. Legislative injunction

Pursuant to sections 4 and 25(a) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended (85 Stat. 973), the Administrator of the Environmental Protection Agency (EPA) proposes to issue a new 40 CFR Part 171. The proposed regulations would establish standard of competence for applicators using pesticides which EPA classifies for "restricted use" pursuant to section 3 of FIFRA.

"One of the principal objectives of the FIFRA amendments enacted October 21, 1972, is to assure the proper use of pesticides. The Congress recognized that the current patterns of pesticide use present both benefits and risks to man's health and environment. The underlying theme of the Congressional deliberations was a search for a balance between those benefits and risks. The need for continued use of pesticides was obvious, but the need for more carefully controlled use was equally obvious. It was concluded that the 1947 FIFRA could not accomplish that control and that it therefore needed to be thoroughly overhauled.

"A basic problem recognized by the Congress was that despite extensive labeling and use instructions, pesticides were being misused on a large scale. Some pesticides were being applied at many times the label concentrations to combat insect resistance.

[1]Excerpted from Federal Register, Vol. 39, No. 37, pp. 6730=6736.

Applicators were being injured by acutely toxic pestidicides because they did not use the prescribed safety measures or misunderstood their proper use. Spray tanks which had been filled with pesticides were washed and indiscriminately drained into streams or city sewers. The environment was being unknowingly and unnecessarily exposed to toxic and persistent chemicals. Label regulation simply was not providing the necessary control over some pesticides to prevent their improper use and the resultant environmental damage.

"The only options EPA had under the 1947 FIFRA for controlling misuse of pesticides, once they had been registered, were suspension or cancellation. A registered pesticide could be bought by almost anyone, and it was not illegal to use it contrary to the label instructions.

"The legislation adopted in 1972 added three key regulatory mechanisms to effectuate the needed additional regulation of pesticides:

"(a) Classification. Pesticides which, without regulatory restrictions extending beyond the instructions and warnings appearing on the label, may generally cause unreasonable adverse effects on the environment, including injury to the applicator, are to be classified for "restricted use."

"(b) Certification. Pesticide applicators must be determined to be competent with respect to the use and handling of pesticides. Certain "restricted use" pesticides will be available only to certified applicators.

"(c) Enforcement. It is illegal to use a registered pesticide "in a manner inconsistent with its labeling."

"The applicator certification program is an attempt to ensure that applicators have sufficient knowledge to prevent acute injury to human health and environmental effects in or near areas being treated with pesticides. To be certified, an applicator will have to be aware, for example, of the potential toxicity of pesticides and know what steps can and should be taken to prevent himself and other individuals from being needlessly exposed; similarly, he must have sufficient knowledge to prevent the most obvious types of localized environmental damage, including acute injury to non-target species and runoff to streams and lakes. Toward these ends, the proposed standards of competence stress "practical knowledge," i.e., possession of pertinent facts and ability to use them in dealing with problems and situations likely to be encountered in an applicator's work.

"2. Pesticide Classification

"By October, 1976, all registered pesticides must be classified for either "general use" or "restricted use" under section 3(d) (1) of FIFRA, as amended. A "general use" pesticide is defined in the Act as one which "will not generally cause unreasonable adverse effects on the environment" when used in accordance with its labeling or widespread and commonly recognized practices; such pesticides normally will be available to the public.

"A "restricted use" pesticide is defined as one which "may generally cause unreasonable adverse effects on the environment, including injury to the applicator" unless it is subject to additional regulatory restrictions beyond labeling. Section 3(d)(1)(C) provides, first, that if a pesticide is classified for "restricted use" because of potential hazards to applicators or other individuals, it can be used only by or under the direct supervision of a certified applicator, and second, that if a pesticide is classified for "restricted use" because of potential environmental hazards, it can be used only (a) by or under the direct supervision of a certified applicator or (b) in accordance with other regulatory restrictions imposed by the Administrator.

"Section 4 requires the Administrator to prescribe standards for the certification of applicators:

> Such standards shall provide that to be certified, an individual must be determined to be competent with respect to the use and handling of the pesticide or class of pesticides covered by such individual's certification.

"3. Applicator Classification.

"The term "private applicator" is defined in the Act as a certified applicator who uses or supervises the use of any "restricted use" pesticide for the purpose of producing any agricultural commodity on property owned or rented by him or his employer or (if applied without compensation other than

trading of personal services between producers of agricultural commodities) on the property of another person.

"The term "commercial applicator" is defined in the Act as a certified applicator (whether or not he is a private applicator with respect to some pesticide uses) who uses or supervises the use of any "restricted use" pesticide for any purpose or on any property other than as provided by the definition of "private applicator."

"4. Certification Responsibility

"Section 4, which provides for applicator certification, reflects the intent of the Congress that States assume the primary responsibility for this activity. States are expected to develop and administer applicator certification programs based on standards of competence which meet or exceed those prescribed by the Administrator. State certification plans must be reviewed and approved by the Administrator and, for this purpose, must be submitted to him by October 21, 1975. EPA strongly believes that applicator certification can most effectively be handled at the State level, where proper consideration can be given to the particular characteristics of agricultural and other uses of pesticides within each State and to existing mechanisms for licensing applicators.

"After October 21, 1976, neither commercial nor private applicators may use those pesticides which are restricted for use only by certified applicators unless they are certified for

this purpose under a state program approved by the Administrator. EPA has no plans to set up a federal certification program for commercial or private applicators; indeed, section 4 does not explicitly prescribe a mechanism for setting up such a program. States therefore are cautioned not to expect that a federal program will be in operation as a substitute for state programs. This means that the availability of certain "restricted use" pesticides after October 21, 1976, will be wholly dependent upon the state's initiative in submitting and implementing certification plans approvable by the Administrator.

"While ultimate responsibility for establishing state certification programs and certifying applicators thus rests with the states, EPA will provide certain types of assistance to the states to help them set up their certification programs. EPA will, to the extent possible, provide technical assistance and guidance but, except for very limited demonstration funds, no direct financial assistance. Financing to set up and operate state programs will therefore be a state responsibility. Toward that end, states are encouraged to explore the practice, already employed by some states, of charging fees, such as licensing fees, for examination and certification of applicators.

"5. Level of Knowledge

"The proposed standards are designed to ensure that applicators will have a "practical knowledge" of the basic elements of pesticide usage, as indicated below. Certification will

require the applicator to be competent and aware of the need for proper use and the consequences of misuse. It is designed to ensure that the applicator knows the importance of correct placement of pesticides to avoid or minimize entry into the environment other than to target areas, knows how to prepare the proper and safest formulation for a given situation, and is aware of what constitutes poor handling, mixing, and storage practices--the leading causes of pesticide accidents. These standards will not require that the applicator fully comprehend the scientific basis for the labeling directions, but rather that he knows how to follow the directions, and has sufficient knowledge to augment them in each use situation to prevent adverse human and enviromental effects and assure proper use of pesticides.

"It is EPA's position that sophisticated academic training should not be necessary to equip an applicator to do such things as identify common types of pests, comprehend instructions and warnings on a pesticide label, make the calculations necessary to arrive at a proper dilution of the product, calibrate application equipment, identify and avoid situations that obviously will result in injury to non-target species, make proper use of protective clothing, and keep pesticide containers out of children's reach.

"6. Agricultural Pest Control Related Certification.

"(a) Agricultural pest control - Plant. Applicators must demonstrate practical knowledge of the crops grown and the

specific pests of those crops on which they may be using restricted use pesticides. The importance of such competency is amplified by the extensive areas involved, the quantities of pesticides needed, and the ultimate use of many commodities as food and feed. Practical knowledge is required concerning soil and water problems, pre-harvest intervals, reentry intervals, phytotoxicity, and potential for environmental contamination, non-target injury and community problems resulting from the use of restricted pesticides in agricultural areas.

"(b) Private applicators. As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems associated with his farming operation and the proper storage, use, handling and disposal of the pesticides he will use for pest control. This practical knowledge includes ability to:

"i. Recognize common pests and damage caused by them.

"ii. Read and understand label and labeling information; the common name of the pesticide; the crop, animal, or site to which it will be applied; pest(s) to be controlled; when and how to apply; safety precautions; and any harvest or reentry restriction(s).

"iii. Apply pesticides in accordance with label instructions and warnings, including the ability to prepare the proper concentration of pesticide to be used under particular circumstances taking into account such factors as area to be covered, speed at which application equipment will be driven, and the quantity dispersed in a given period of operation.

"iv. Recognize environmental situations that must be considered during application to avoid contamination.

"v. Recognize poisoning symptoms and procedures to follow in case of a pesticide accident.

"Such competence of each private applicator shall be verified by the responsible state agency through the administration of a private applicator certification system which insures that the private applicator is competent, based upon the standards set forth above, to use the restricted use pesticides under limitations of applicable state and federal laws and regulations. A certification system shall employ a written or oral testing procedure, or such other equivalent system as may be approved as part of a state plan."

Purpose

The present project addressed itself to the acquisition of information to be used in programing for pesticides application certification training. Its purpose was: (a) assessment of current need for training assistance (b) the development of necessary curriculum; (c) organization and conduct of a pilot training program; (d) assessment of the methods and materials employed; (e) assessment of the potential use of such approaches as retraining or refresher training tools; and (f) performance of a cost analysis.

Assessment for Current Need for Training Assistance. Although several states have recently surveyed local existing pesticide use practices (Farmer's Pesticide Use Decisions and Attitudes on Alternate Crop Protection Methods, 1974) and prepared study guides (North Carolina Pesticide Training Manual, 1973; Pesticide Applicators Training Manual, 1974; Preparing for Applicator Certification, Vol. 1, 1974; and Cooperative Extension Service of Kansas State University, 1974), no research on the relative effectiveness and efficiency of instructional delivery systems providing training for examination pursuant of certification has been reported.

Little experimental research addressing itself to adult learners and the unique circumstances accompanying their pursuit of knowledge has been reported (Review of Educational Research, 1950, 1953, 1959). Yet the total milieu of the adult learning experience makes straightforward application of findings on children and adolescents suspect. Research on the relative effectiveness and efficiency of delivery systems in adult learning is needed. It was the central purpose of this project to provide just such needed research and thereby establish a data base for effective training of pesticide applicators. Investigation of the relative effectiveness of four instructional delivery systems, (a) conventional reading, (b) audio assisted programed, (c) printed programed, and (d) synchronized slide tape, was a specific focus.

The acquisition of relevant knowledge and accompanying attitudinal differences were the main areas of interest to the investigators. Main questions of concern to the investigators were:

1. Is there a significant difference among the four delivery systems in the learning of basic concepts needed for pesticide applicator certification as tested by a 30-item multiple choice test?

2. Is any delivery system significantly better than any other delivery system in teaching different types of concepts, e.g., does printed programed teach calibration concepts more effectively than audio-assisted programed?

3. Is there a significant difference between delivery systems in attitude toward the specific delivery system the learner studied and the training program in general?

4. What are the present attitudes of the participants toward (a) pesticide usage and (b) a requirement of certification?

5. Do achievement scores or attitude scores correlate significantly with selected demographic characteristics of the learners (e.g. age, years in farming, educational background)?

The subsequent sections of this report (a) review the research literature on delivery systems with adult learners; (b) delineate the total procedure for preparation of included curriculum and delivery systems; (c) discuss the experimental design used in testing these materials; (d) present the results of statistical analysis; and (e) discuss possible implications and applications of the findings.

CHAPTER II

Literature Review

Purpose of Review

This review summarizes findings on experimental evaluations of the four types of instructional delivery systems employed in this study -- conventional reading, printed programed, audio assisted programed, and synchronized slide tape. Specifically included are studies in which a system used as an auto-instructional method is compared to the traditional methods of lecture, discussion and/or demonstrations. In many cases, the traditional method also included textbooks, laboratory sessions, and instructor tutorials.

Review Sources

Computor assisted ERIC searches were conducted by the University of Nebraska at Omaha and by the Wisconsin Information Retrieval Service, Wisconsin Department of Public Instruction.

A manual search of recent (1970-75) volumes of Education Index, Current Index to Journals in Education, Research in Education, and Abstracts of Research and Related Materials in Vocational and Technical Education was conducted.

Most research reports published between 1966 and 1971 were of a generally non-experimental nature, with only a small number attempting to assess the instructional effectiveness of audio-visual media, especially in the field of adult education (Campeau, 1974). The searches conducted for this review confirm

that little research has been done in this area since 1971. Especially lacking are studies dealing with an adult population outside the university environment. However, a few studies concerning the vocational, industrial, and military training of adults seemed appropriate for inclusion.

Some research did not deal with the use of instructional delivery systems in an autoinstructional mode, but examined such systems as a part of a larger integral system. These research studies were included if the adjunct delivery system was clearly compared to a conventional instructional method for effectiveness.

Scope of the Review

Overall the review is limited to studies concerning adult populations. The adult learner is defined as one past the secondary school student age limit and generally found in a college-university, military, vocational education, or continuing education setting. Some studies are included in which the sample is composed of high school classes or students, but only if they specifically meet the requirement of comparing an autoinstructional delivery system with conventional teaching methods.

Only studies concerning the teaching of concepts or skills similar to those in lessons or lectures for adults are included. Where control and experimental groups were compared, comparability was established by pre-experiment criteria, and the subject matter covered by each was the same.

Conventional Reading

Conventional textual material is often regarded as the original autoinstructional delivery system and is frequently used as a control in many studies measuring the effectiveness of audiovisual media. Hence, the effectiveness of the printed text as an autoinstructional delivery system as compared with other media will be discussed in subsequent sections reviewing other media.

The general lack of research on textbooks may be explained by Lumsdaine's (1963) suggestion that

> the usual textbook does not control the behavior of the learner in a way which makes it highly predictable as a vehicle of instruction or amenable to experimental research. It does not in itself generate a describable or predicatable process of learner behavior, and this may be the reason why there has been very little experimental research on the textbook (pp. 585-586).

Printed Programed Instruction

Reviewers of evaluative studies of research on programed instruction agree that

> students can learn effectively, often more effectively, from all types of programed materials, whether in the form of linear or branching programs, and from programs on machines or programs in texts, than from more conventional instructional stimuli (Moldstad, 1974, p. 396).

Schramm (1964) undertook an extensive survey of early research on programed instruction. Of 36 studies reviewed comparing programed instruction with traditional classroom instruction, 18 showed no significant difference between the two in performance outcome, while 17 showed programed instruction to be significantly superior, and one showed traditional instruction to be significantly superior.

A sampling of more recent studies with adult learners (see Table 1) did not reveal the same ratio of results in comparing the effectiveness of programed instruction with conventional methods. Programed textbooks were found to be significantly more effective than conventional texts in college level psychology and English classes by Daniel and Murdoch (1968) and Hamilton and Heinkel (1967) respectively, but Giess and Stockdale (1966) reported no difference in instructional effectiveness between a programed workbook and a conventional workbook in a college level English grammar course. Unwin (1966) and Wilds and Zachert (1966) arrived at a result of no significant difference when comparing the effectiveness of linear programs with traditional classroom lecture discussions in university level courses.

While programed instruction and conventional texts were equally effective in teaching troubleshooting knowledge in an automotive course, Finch (1966) found neither to be as effective as equipment-oriented instruction in teaching troubleshooting performance skills. Forty-five community college students received an initial presentation in ignition principles and took the Otis Mental Ability Test to establish a covariate.

Table 1

Relative Effectiveness of Using Programed Instruction as an Autoinstructional Delivery System

Study	N and Population	Difference[a]	Comments
Daniel and Murdoch (1968)	526 College undergraduates	PI[b]	Programed text vs. conventional text; course contents of operant psychology.
Hamilton and Heinkel (1967)	116 college undergraduates	PI	Programed text vs. conventional text for "review English" class.
Giese and Stockdale (1966)	College students	None	Conventional vs. programed grammar workbook; latter required less time to complete.
Unwin (1966)	45 college undergraduates	None	100-frame programed text vs. lecture-tutorials in engineering course.
Wilds and Zachert (1966)	90 medical school students	None	830-frame linear program vs. 8 hours classroom instruction in gynecological oncology.
Finch (1966)	45 community college students in automotive course	None	Three treatment groups compared: programed instruction, text-oriented, and equipment-oriented.
Bockman (1971)	124 lower division metals class students	None	Conventional text plus lectures, chalkboard notes and discussion vs. illustrated programed texts.

[a]Experimental instructional delivery system was significantly more effective than control method where indicated by abbreviation.

[b]PI = Printed programed.

They were then divided into three treatment groups: (a) equipment oriented; (b) text oriented; and (c) programed instruction. Posttests consisted of an attitude inventory, troubleshooting knowledge test, and troubleshooting performance test. Analysis of covariance showed that there were no significant differences in troubleshooting knowledge or in attitudes toward the systems of instruction. The equipment oriented group performed significantly better in troubleshooting ($p < .01$) than the other two groups.

With respect to a time delay effect on learning by programed instruction, differences in effectiveness between illustrated programed texts and traditional lecture-discussions in teaching a unit from a college level metals class were found to be negligible five weeks after the instruction ended (Bockman, 1971).

Programed instruction as an adjunct to integrated methods of instruction was treated in several research studies (see Table 2). In working with high school populations, Klaus and Lumsdaine (1960) and Goldbeck, Shearer, Campeau, and Willis (1962) found that programed instruction as an adjunct significantly enhanced gains in learning. Studies conducted with college and university student populations also confirmed the value of programed instruction as an adjunct to traditional methods.

Programed instruction used in conjunction with conventional instruction had overall significantly greater effectiveness than either method used alone (Hatch and Flint, 1962). Studies by Marsh and Pierce-Jones (1968) showed that students in an adolescent psychology laboratory, who completed programed materials

Table 2

Relative Effectiveness of Using Programed Instruction as an Adjunct to Other Instructional Delivery Systems

Study	N and Population	Difference[a]	Comments
Klaus & Lumsdaine (1960)	High school physics classes	PI[b]	Control and experimental groups received instruction by same methods; experimental group used programed materials as adjunct, and control used conventional workbooks.
Goldbeck, Shearer, Campeau & Willis (1962)	150 students in six high school government classes	PI	Programed texts with regular classroom instruction vs. programed alone vs. conventional instruction alone.
Hatch & Flint (1962)	Junior college basic electronics classes	PI	Programed instruction plus conventional methods vs. programed vs. conventional instruction.
Marsh & Pierce-Jones (1968)	295 university adolescent psych lab students	PI	Programed materials with regular instruction vs. tasks other than programed instruction with regular instruction.
Marsh & Pierce-Jones (1968)	295 university adolescent psych lab students	None	Programed text vs. programed teaching machine.
Barnes (1970)	214 university physical science lab students	None	Programed materials vs. conventional workbook plus lab instructor tutorials.
Alexander (1970)	90 college remedial reading	None	Dictionary vs. programed materials as supplement to teacher instruction.
McDaniel (1968)	Physical therapy aide trainees	None	Formal group training with programed instruction vs. formal training without programed vs. on-job training only.
Bushnell (1963)	Journeyman electrician trainees	None	Program with inexperienced monitor vs. program with experienced monitor vs. traditional classroom instruction.

[a]Experimental instructional delivery system was significantly more effective than control method where indicated by abbreviation.

[b]PI = Printed programed.

as an adjunct to regular instructional methods scored significantly higher on a 100-item multiple choice test than students who completed tasks other than programed instruction in the same laboratory. Barnes (1970), however, found that the use of programed materials in a physical science laboratory had no significantly greater effectiveness than conventional materials supplemented by tutorials. Pretest and posttest scores, along with a specially prepared laboratory performance test, showed no significant difference in knowledge or performance abilities between the control and experimental groups.

Research to date shows that vocational training for adults can be achieved as effectively with programed instruction (either autoinstructional or adjunct) as with conventional methods. Bushnell (1963) reported that a training program for journeyman electricians using a branching type electrically operated teaching machine was as effective as conventional classroom instruction provided by an experienced instructor. McDaniel (1968) compared the effectiveness of a formal group training program with and without programed materials. A control group of physical therapy aides trainees (class of 1963) was compared with an experimental group of trainees (class of 1967) who received teaching machine instruction in addition to the basic training consisting of lectures, demonstrations, practice and on-the-job training. A second control group (class of 1961) received on-the-job training only. Tests developed to evaluate the effectiveness of curriculum and materials showed a significant difference between on-the-job training and formal training with or without programed instruction ($p < .05$) with more

knowledge attained by the latter. However, there was no significant difference reported between the classes receiving formal group training with or without programed instruction.

In summary, although early research reported favorable results on the superior or equal effectiveness of programed instruction compared with traditional teaching methods (Schramm, 1964), more recent research dealing with adolescent or adult populations did not confirm such comparability so emphatically.

Audio Assisted Programed Instruction

During the period 1960 through 1972 very little experimental research was found concerning the value of a tape recorded unit of instruction in learning effectiveness (Campeau, 1966, 1974). Wendt and Butts (1960) reviewed studies from an earlier period covering a wide range of subject matter and sample population ages. Five studies summarized by them showed no significant difference in using tape recordings compared to conventional instruction and one study favored conventional instruction over tape-recorded instruction.

Campeau (1974) also pointed out that the obvious setting for experimental research -- the language laboratory -- had been utilized but rarely. A study conducted by Antioch College (1960) could find no significant differences in achievement between language classes using a language laboratory as an adjunct to conventional methods and classes studying by conventional methods alone. Lorge (1963), however, reported significantly better scores on measures of fluency, intonation, and understanding of spoken French in high school language classes using a language laboratory.

Studies of the effectiveness of tape recorded and audio assisted instruction outside the language laboratory were also inconclusive (see Table 3). Of four studies reviewed here, two indicated some superiority of audio assisted instruction as an autoinstructional delivery system over conventional instruction systems. Stuck and Manatt (1970) contrasted two groups of pre-service teachers in a class studying concepts of school law. The experimental group was given one week to utilize recordings in audiotutorial booths to learn 18 aspects of school law. Printed reference material was also available. The control group attended seven hours of live lectures covering the same material. From pre-post test gain scores on an instrument devised by an outside panel of experts, the experimenters concluded that the audiotutorial group learned significantly more than the control group.

In another study (Brock and McCutcheon, 1971) an "Audio Notebook" was developed to teach shipboard personnel the procedures for using a sound powered telephone. A programed instruction audio tape was used with the miniaturized, multi-track tape recorder. Results indicated that all enlisted personnel aboard ship qualified in learning the technique of operation and the symbology necessary for reporting damage aboard ship to the Damage Control Assistant, the officer in charge of directing damage control procedures. The usual method of learning by on-the-job experience and group demonstration was significantly less effective. In the same study, another sample group of 60 fresh recruits showed significant improvement in using a sound powered telephone.

Table 3

Relative Effectiveness of Using Audio Assisted Autoinstructional and Adjunct Delivery Systems

Study	N and Population	Difference[a]	Comments
Antioch College (1960)	University foreign language classes	None	Conventional instruction with language laboratory vs. conventional instruction only.
Lorge (1963)	High school French classes	AA[b]	Language lab facilities with conventional instruction vs. conventional instruction alone.
Stuck & Manatt (1970)	219 university seniors in school law course	AA	Audiotutorial booths plus reference material vs. live lectures.
Brock & McCutcheon (1971)	Enlisted naval personnel	AA	Programed audio tape used for giving instruction in use of sound powered phone.
Popham (1961)	Graduate students in educational research	None	Tape recorded lectures and brief discussions vs. standard lecture-discussions.
Popham (1962)	College education class	None	Student-led discussions plus taped lectures vs. standard lecture-discussion.
Menne, Hannum Klingensmith & Nord (1969)	360 college introductory psychology class members	None	Taped lectures with booklet of chalkboard notes and supplementary films vs. live lectures and supplementary films.
Sellman (1970)	Air Forde enlisted personnel	AA	Three formats of career development course compared: conventional vs. less verbal with more illustrations vs. less verbal with more illustrations and supplementary tape recordings.

[a]Experimental instructional delivery system was significantly more effective than control method where indicated by abbreviation.

[b]AA = Audio assisted.

Other studies, however, showed no significant differences between groups taught by tape recordings as an autoinstructional delivery system and those taught by traditional methods. Popham (1961, 1962), contrasting the results of using a series of tape recorded lectures with results from standard discussion methods in teaching college education courses, found no significant differences. Menne, Hannum, Klingensmith, and Nord (1969) compared an experimental program of tape recorded lectures supplemented by a booklet of chalkboard notes and attendance of films with instruction by live lectures. On the basis of data obtained from three identical, objective multiple choice examinations given over the course of study, no significant differences were found between the two groups. A replication of the experiment, reported in the same article, yielded similar results.

Sellman (1970) studied the effectiveness of tape recordings as adjuncts to other teaching systems. A Career Development Course (CDC) was presented to air force personnel of high, middle, and low aptitudes in verbal skills in three ways: (a) As a conventional format; (b) as a less verbal format with more illustrations; and (c) as a less verbal format with more illustrations and supplemented by tape recordings of information complementary to the written text. Data were collected on learning performances, reading speeds, and attitudes toward the CDC formats. The third format produced significantly increased learning scores in all groups.

In summary, data gathered on audio assisted or tape recorded instructional delivery systems for this review are very sparse, especially with regard to adult learners.

Synchronized Slide Tape

Studies seeking to evaluate the effectiveness of learning by slide tape as an autoinstructional delivery system (see Table 4) obtained mixed results. Amelon (1969) divided college level classes in bench metal work and welding into two groups. Six selected units of instruction were taught by conventional group demonstration methods to the control group. The same units were taught by individualized self-instruction slides and audio tapes to the experimental group. Pre- and post-test scores for two units were significantly higher for the control group. The experimental group scored significantly higher in one unit. For the remaining three units there were no significant differences between the groups.

Kolmos (1969) also found slide tape instruction alone to be less effective than conventional teaching methods, and less effective than slide tape autoinstruction accompanied by laboratory sessions. A course in elementary descriptive statistics was taught to four groups of elementary education majors. The first group studied on their own in study carrels, using a 35-mm. slide tape of 20 half hour lessons. The second group used the same slide tape series, supplemented with mandatory attendance at 30-minute laboratory sessions once a week. A third group received classroom instruction covering the same material as on the slide tape. A fourth group participated in traditional lecture-discussions. Results showed that the first group scored significantly lower than any other group, with the experimenter concluding that a minimum of teacher-student contact and interaction greatly increases the effectiveness of slide tape instruction as an autoinstructional delivery system.

Table 4

Relative Effectiveness of Using Slide Tape Autoinstructional Delivery System

Study	N and Population	Difference	Comments
Amelon (1969)	College Students in bench metals and welding classes	Mixed See Comment	Out of six units of instruction, in two units control instruction was significantly better; in two units there was no significant difference between methods; and in one unit, the experimental method was significantly better.
Kolmos (1969)	Elementary education classes	None	Slide tape instruction alone vs. slide tape plus labs vs. classroom instruction vs. lecture-discussion. Slide tape instruction alone was least effective.
Young (1969)	126 Eleventh grade boys	None	Slide tape autoinstruction vs. printed brochures.
McVey (1970)	High school classes in vocational agriculture	None	Audiotutorial machines using slide tapes vs. traditional classroom methods; three out of four classes showed no significant differences.

A study by Young (1969) did not deal with adults or post-secondary education, but it is relevant to this review because of its comparison of the use of slide tape instruction with a conventional printed brochure. Eleventh-grade boys in six central Missouri public schools were presented information regarding industrial arts teaching as a career choice. Pre- and post-test scores indicated that there were no significant differences between the effects of conveying information by the two methods. Post measures were secured 30 days after the presentation, indicating lasting results for both methods. McVey (1970) also found inconclusive results on the effectiveness of autoinstructional slide tapes in teaching a high school level vocational agriculture course. Six experimental schools used audiotutorial machines with programs of 20 minutes maximum length with 59 or fewer slides in four subject matter areas of instruction. Six control schools received the same reference material and teaching outline for the 14-day experiment. No significant differences were found for any of the four class level comparisons. The audiotutorial delivery system was not significantly more effective than the control method in teaching animal health, commercial fertilizers, and small gas engines. The audiotutorial delivery system was found to be significantly more effective in teaching a class in farm credit.

In summary, a blanket statement of the effectiveness of slide tape instructional delivery systems cannot be made here due to the lack of experimental research reports of the use of such systems with adult learners.

Multi-Media Instructional Delivery Systems

In the search for information on reports dealing with slide tape instructional systems and audio assisted instruction, reports on multi-media instructional systems were also found. Edwards, Williams and Roderick (1968) reported on the effectiveness of an audiovisual tutorial laboratory for teaching business machines skills and typing skills to community college students. While performance examinations showed that experimental groups learned significantly more than control groups, the relative value of each part of the audiotutorial system in contributing to overall effectiveness was not determined.

Wilds and Zachert (1966) compared a multi-media system with a programed instructional delivery system. The control group learned via tape recorded lectures, accompanied by the extensive use of slides and other visual aids, while the experimental group used a program. The results indicated no significant differences between the two treatment groups.

A descriptive account by Sandhofer and Nichols (1968) of a program development detailed a learning system for below average adult learners. An automated audiovisual instructional system, consisting of programed question and answer booklets, tape recordings synchronized with color slides, structured practice, and human supervision, was used for training janitors and duplicating machine operators. The programed booklets were found to be of no added value for training janitors, but they were of great value in training duplicating machine operators. For both groups, the highly pictorial nature of the delivery system enhanced the effectiveness of imparting necessary skills to these adult learners.

Table 5

Relative Effectiveness of Using Multi-Media Autoinstructional Delivery Systems

Study	N and Population	Difference[a]	Comments
Edward, Williams, and Roderick (1968)	Community College students in business machines classes	MM[b]	Continuous loop sound-film plus slides with tapes vs. conventional classroom.
Edwards *et al.* (1968)	Community college typing classes	MM	Continuous loop film cartridges with synchronized narration plus slide tapes and tape recordings vs. traditional instruction.
Wilds and Zachert (1966)	90 medical school students, Junior class	None	Taped lectures supplemented with slides and other visual aids in traditional setting vs. programed instruction.
Sandhofer and Nichols (1968)	Adult vocational trainees in janitorial and duplicating machine operator positions	See comment	A descriptive study of programed booklets and tapes synchronized with slides and on-job practice system; description of development and implementation; no controls for comparison used.

[a]Experimental instructional delivery system was significantly more effective than control method where indicated by abbreviation.

[b]MM = Multi media.

In summary, these multi-media studies measured gross effects that the combined media produced on learning, but did not provide for measuring the relative effectiveness of each individual medium.

Other Effectiveness Considerations

Cost. As a general rule, the selection of conventional textual material as an instructional delivery system carried with it the obvious advantage of low cost per unit. Slide tape self-instruction is also relatively low in cost once developed and reproduced. However, the initial cost of developing and producing slide tape auto instructional delivery systems is high in terms of time and money (Sandhofer and Nichols, 1968).

Instruction and Learning Time. The use of programmed instruction resulted in a substantial savings in time for the instructor and learner (Giese and Stockdale, 1966; and McDaniel, 1968). Hughes and McNamara (1961) found that a class of IBM customer engineers using programed texts completed their training course in an average of 8.8 hours compared to 15 hours for a control group taught by a lecture-discussion method. Attiyeh, Bach and Lumsden (1969) also reported a considerable savings in instructional time in their nationwide experiment involving the teaching of elementary economics to 4121 students in 48 schools and universities. Analyses performed on a criterion test revealed that students using programed materials learned as much in 12 hours as control groups did in a seven week conventionally taught course.

Audio assisted instruction as an autoinstructional delivery system (Menne et al., 1969) offered a savings in time for

Table 6

Other Effectiveness Considerations of
Using Autoinstructional Delivery Systems and Adjuncts

Study	N and Population	IDS[a]	Comments
Hughes & McNamara (1961)	IBM customer engineers	PI	Time-saving; 8.8 hours of programed instruction needed to cover 15 hours of lecture-discussion.
Attiyeh, Bach & Lunsden (1969)	4121 elementary economics students	PI	Twelve hours programed instruction vs. seven weeks conventional classroom instruction.
Giese & Stockdale (1966)	College students	PI	Conserves instructor time.
McDaniel (1968)	Physical therapy aide trainees	PI	Conserves instructor time, while providing for flexible scheduling and standardization of course content.
McKee (1970)	Corrections institutions inmates	PI	Students liked self-pacing, non-competitive nature of programed instruction.
Reed (1971)	High school vocational agriculture classes	PI	Effective for students at different levels of mechanical aptitude.
Bockman (1971)	124 lower division metals class	PI	Effective in teaching concepts or skills to heterogeneous groups.
Brock & McCutcheon (1971)	Enlisted naval personnel	PI	Effective in teaching heterogeneous groups.
Bushnell (1963)	Journeyman electrician trainees	PI	Less student satisfaction yielded by programed instruction alone than with live instructor interaction.
Menne et al., (1969)	360 introductory psych course students	AA	Saves instructor time.

[a]IDS = Instructional delivery systems: PI = programed instruction; AA = audio assisted instruction; and ST = slide tape instruction.

Table 6 (cont'd)

Other Effectiveness Considerations of
Using Autoinstructional Delivery Systems and Adjuncts

Study	N and Population	IDS[a]	Comments
Stuck & Manatt (1970)	219 senior school law students	AA	No savings in learning time indicated by results.
Amelon (1969)	College classes in bench metals and welding	ST	Time savings in individual scheduling reported.
Sandhofer & Nichols (1968)	Vocational trainees	ST	Time savings in individual scheduling and relatively low in cost to administer; initially high cost to develop and reproduce.

[a]IDS = Instructional Delivery system: PI = programed instruction; AA = audio assisted instruction; and ST = slide tape instruction.

instructors and perhaps for students, depending on how the self-pacing aspect of the system was utilized. No specific saving in instruction time was noted by Stuck and Manatt (1970).

Slide tape self-instruction was recommended as a time saver in individual scheduling (Amelon, 1969; and Sandhofer and Nichols, 1968).

Teaching heterogeneous groups. Programed learning systems were especially effective for instructing heterogeneous groups because of their self-pacing aspect, lack of forcing competition among learners, and usefulness in instructing students of different aptitudes (Bockman, 1971; Brock and McCutcheon, 1971; McDaniel, 1968; McKee, 1970; and Reed, 1971).

Summary

Campeau (1974) summarized the state of past and current research on the effectiveness of different instructional delivery systems in teaching and adult learner thus:

> What is most impressive about the formidable body of literature ... is that it shows that instructional media are being used extensively, under many diverse conditions, and that enormous amounts of money are being spent for the installation of very expensive equipment .... Indications are that decisions as to which audio-visual devices to purchase, install, and use have been based on administrative and organization requirements and on considerations of cost, availability, and user preference, not on evidence of instuctional effectiveness -- and no

> wonder. To date, most research in post-school education has not provided decision-makers with practical, valid, dependable guidelines for making these choices on the basis of instructional effectiveness (p. 31).

Little progress has been made in the areas of research on instructional effectiveness, especially for the adult learner, in recent years. Most studies comparing the effectiveness of an autoinstructional delivery system with the traditional instructional approaches have obtained inconclusive results, i.e., in general, the instructional delivery system has not been proven superior to conventional teaching methods.

Studies on the relative effectiveness of self-instructional systems are needed to further clarify both their overall and relative effectiveness in teaching knowledge or skills. Due to the high diversification of learning settings, styles, content, interests, background, and needs of adult learners, research on this population's use of various instructional delivery systems is urgently needed to provide efficient and effective learning experiences for this rapidly growing group of learners.

CHAPTER III

Materials and Methods

Preparation of Curriculum Materials

Four major kinds of individualized instructional materials were prepared for the conduct of this study: (a) printed programed; (b) audio assisted programed; (c) conventional readings; and (d) synchronized slide tape. Also prepared were pesticide knowledge examination forms consisting of multiple choice questions; a scale to measure attitude toward instructional materials; and an interview schedule to obtain demographic data and information on attitudes toward pesticide usage and regulation.

Individualized Instructional Materials

Selection of content. Section 171.5 of section 4, FIFRA as amended in 1972, outlines standards for certification of private applicators:

> As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems and pest control practices associated with his agricultural operations, proper storage, use, handling and disposal of the pesticides and containers, and his related legal responsibility. This practical knowledge includes ability to:
>
> (a) Recognize common pests to be controlled and damage caused by them.
>
> (b) Read and understand the label and labeling information -- including the common name of pesticide he applied; pest(s) to be controlled; timing

and methods of application; safety precautions; and pre-harvest or re-entry restrictions; and any specific disposal procedures.

(c) Apply pesticides in accordance with label instructions and warnings, including the ability to prepare the proper concentration of pesticide to be used under particular circumstances taking into account such factors as area to be covered, speed at which application equipment will be driven, and the quantity dispersed in a given period of operation.

(d) Recognize local environmental situations that must be considered during application to avoid contamination.

(e) Recognize poisoning symptoms and procedures to follow in case of a pesticide accident. (Federal Register, 1974, p. 6736).

The five designated areas of content were included in the instructional materials, with each area organized into a separate unit: (a) Unit I - Common Pests; (b) Unit II - Label Reading; (c) Unit III - Calibration; (d) Unit IV - Environmental Considerations; (e) Unit V - Basic Safety. Specific content was selected by entomologists, agronomists, and plant pathologists employed by the Nebraska Cooperative Extension Service, who are specialists in pest control and pesticide safety.

Writing and preparation. (1) Conventional reading materials (see Apperdix A). A straight discursive style was used in writing the selected content into the conventional reading format. A moderately low reading difficulty level was required. Illustrative line drawings were incorporated to enhance the comprehensibility of the materials. The content of this format was subsequently edited and approved by the same team of pest control and pesticide safety specialists who selected the content. The approved conventional reading materials were used by the three media specialists who prepared the audio assisted, printed programed, and synchronized slide tape instructional materials as the content was to be parallel in each of the four instructional delivery systems. The conventional reading materials were number and color coded by unit for ready reference use with the printed programed materials.

(2) Printed programed materials (see Appendix B). A specialist in printed programing prepared the selected content in a linear program format which employed a latent image developer pen to reveal selected choices. The conventional reading materials were cross-referenced in this program and instructions for their use when failures were incurred in the programed materials were explicitly stated.

(3) Audio assisted (see Appendix C). The audio assisted materials consisted of an audio tape with an accompanying workbook guide for use with the audio tape. A specialist

in audio assisted instruction prepared both the written and audio materials. The announcer's voice for the audio programing was carefully selected to be congruent with the content under discussion and acceptable to the proposed audience.

(4) Synchronized slide tape (see Appendix D). The materials for the synchronized slide tape instructional delivery system were prepared by a specialist in this area of media. No written materials were incorporated into this system; however, a copy of the script was prepared for ready reference by the experimental team.

The content and materials in each delivery system were presented to the content selection team for their critique After appropriate editing all were approved for use in the experiment.

All written materials were printed and bound into booklet form with color coded covers to insure ease in distinguishing among the delivery systems materials.

Pesticide Knowledge Examination

A 45-item multiple choice test was prepared on the content of the instructional materials. An entomology class of 40 University of Nebraska undergraduates was instructed to read the conventional reading materials and was subsequently administered the multiple choice test. An item analysis was performed on this test administration and the test appropriately revised. A 30-item revised form of the test was approved for use in the field

experiment. An item analysis of this 30-item instrument computed on the scores of the 203 participants in the field experiment study yielded the following characteristics: (a) mean = 19.25; (b) standard deviation = 3.55; (c) kurtosis = -1.19; (d) skewness = -.89; and (e) standard error = .24. A criterion-referenced reliability coefficient (Livingston, 1970) of .85 was obtained on this data when computed on the split-half reliability coefficient and a criterion score of 25 (Mahrens & Lehmann, 1973).

Attitude Scale

A 37-item attitude scale (Appendix G) was composed by selecting items from existing attitude and evaluation forms used in the Cooperative Extension Service of the University of Nebraska-Lincoln. These items were worded to fit precisely the present study. Thirty-five of the selected and adjusted items were 5-point Likert scales and the remaining two items open-ended questions. A K-R 21 correlation coefficient of internal consistency (Mahrens & Lehmann, 1973) calculated from the test protocols of the 203 field experiment subjects on the 35-item Likert scales was .77. The mean equaled 16.38; standard deviation equaled 2.73; standard error equaled .19; kurtosis equaled -.47; and skewness equaled -.15.

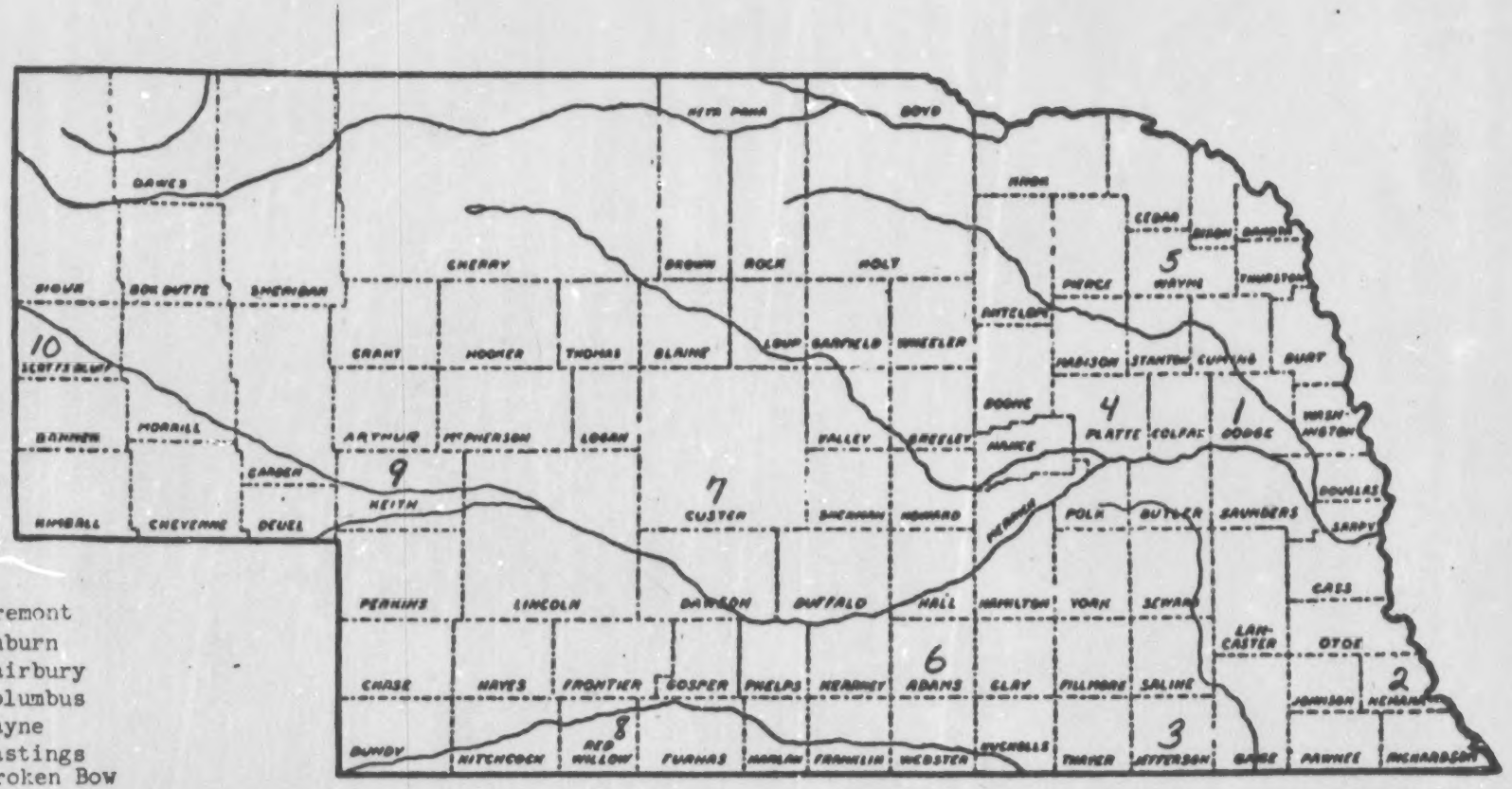
Demographic Interview Scale

A 13-item data sheet was composed to gather pertinent individual data on the subjects and their basic attitudes toward pesticide usage and the impending licensure ruling.

Two of these 13 categorized items contained an open-ended component. The instrument was checked for content and face validity by project director and writer.

Subjects

The four instructional delivery systems were tested at each of ten settings across the state of Nebraska (see Figure 1). Farmers were familiarized with purpose of the study and invited to participate by the county agent in each of these settings. Twenty of the volunteer farmers from each location were selected to participate in the study. Each was paid mileage and five dollars an hour for his participation time. A total of 203 farmers (all male) participated in the study. In three cases selected alternates appeared who were not required for the study but who were allowed to participate. At each of the 20 testing centers the four instructional delivery systems were randomly assigned to the participants (see Table 7). The participants represented residents from 14 counties in Nebraska (see Table 8). The age (see Table 9) of the total population ranged from 18 to 65 with a mean age of 39.6. The mean educational level (see Table 10) of the participants was high school completed. The average number of years in farming (see Table 11) was 15.0 with a median of between 500 - 999 acres under production (see Table 12). Table 13 represents the frequencies of the participants' information sources regarding usage of pesticides. Differential types of pesticide applicator equipment were reported used by participants as represented in Table 14. With one exception



1. Fremont
2. Auburn
3. Fairbury
4. Columbus
5. Wayne
6. Hastings
7. Broken Bow
8. McCook
9. Ogallala
10. Scottsbluff

Figure 1. County extension office locations for collecting data from individuals studying pesticide instructional material.

Table 7

Number and Percentage of Participants at Each Testing Location

	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
Testing Center	n	%	n	%	n	%	n	%	n	%
Scottsbluff	21	10.3	6	11.5	5	9.8	5	10.0	5	10.0
Broken Bow	23	11.3	7	13.5	6	11.8	5	10.0	5	10.0
Wayne	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Columbus	19	9.4	4	7.7	5	9.8	5	10.0	5	10.0
Fairbury	21	10.3	6	11.5	5	9.8	5	10.0	5	10.0
Auburn	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Ogallala	17	8.4	3	5.8	4	7.8	5	10.0	5	10.0
McCook	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Hastings	22	10.8	6	11.5	6	11.8	5	10.0	5	10.0
Fremont	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 8

Home Counties of Participants

	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
Home County	n	%	n	%	n	%	n	%	n	%
Adams	22	10.8	6	11.5	6	11.8	5	10.0	5	10.0
Butler	4	2.0	1	1.9	1	2.0	1	2.0	1	2.0
Colfax	6	3.0	2	3.8	1	2.0	2	4.0	1	2.0
Custer	23	11.3	7	13.5	6	11.8	5	10.0	5	10.0
Dodge	19	9.4	4	7.7	5	9.8	5	10.0	5	10.0
Jefferson	21	10.3	6	11.5	5	9.8	5	10.0	5	10.0
Keith	17	8.4	3	5.8	4	7.8	5	10.0	5	10.0
Nemaha	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Platte	6	3.0	0	.0	4	7.8	1	2.0	1	2.0
Polk	4	2.0	1	1.9	0	.0	1	2.0	2	4.0
Red Willow	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Scottsbluff	20	9.9	6	11.5	4	7.8	5	10.0	5	10.0
Washington	1	.5	1	1.9	0	.0	0	.0	0	.0
Wayne	20	9.9	5	9.6	5	9.8	5	10.0	5	10.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 9

Ages of Participants

	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
Age of Participants	n	%	n	%	n	%	n	%	n	%
Under 20	1	0.5	0	.0	0	.0	0	.0	1	2.0
20-29	40	19.7	10	19.2	13	25.5	8	16.0	9	18.0
30-39	64	31.5	12	23.1	13	25.5	22	44.0	17	34.0
40-49	63	31.0	18	34.6	16	31.4	14	28.0	15	30.0
50-59	32	15.8	9	17.3	9	17.6	6	12.0	8	16.0
60 and over	3	1.5	3	5.8	0	.0	0	.0	0	.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 10

Participant's Educational Levels

Level of education completed	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
8th grade and less	10	4.9	3	5.8	4	7.8	1	2.0	2	4.0
9-11th grade	8	3.9	1	1.9	2	3.9	3	6.0	2	4.0
High school grad.	89	43.8	25	48.1	16	31.4	22	44.0	26	52.0
Trade, business or technical school	6	3.0	1	1.9	2	3.9	3	6.0	0	.0
Some college (1-3 years)	43	21.2	11	21.2	13	25.5	9	18.0	10	20.0
College graduate with degree	43	21.2	9	17.3	13	25.5	11	22.0	10	20.0
College 4 years without degree	3	1.5	2	3.8	0	.0	1	2.0	0	.0
Graduate degree (masters or doctorate)	1	.5	0	.0	1	2.0	0	.0	0	.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 11

Participant's Years in Farming

Years in farming	Sample									
	Total		Conventional reading		Printed Programed		Audio assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
Less than 2 years	3	1.5	0	.0	1	2.0	1	2.0	1	2.0
2-5 years	29	14.3	6	11.5	8	15.7	5	10.0	10	20.0
6-10 years	23	11.3	9	17.3	4	7.8	2	4.0	8	16.0
11-15 years	30	14.8	4	7.7	6	11.8	12	24.0	8	16.0
16-20 years	48	23.6	14	26.9	13	25.5	12	24.0	9	18.0
21 or more years	70	34.5	19	36.5	19	37.3	18	36.0	14	28.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

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Table 12

Participants' Acres Under Production

Acres under production	Total		Sample: Conventional reading		Printed programed		Audio-assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
Less than 50	2	1.0	0	.0	0	.0	1	2.0	1	2.0
50-99	3	1.5	0	.0	1	2.0	1	2.0	1	2.0
100-499	84	41.4	26	50.0	20	39.2	14	28.0	24	48.0
500-999	69	34.0	16	30.8	20	39.2	21	42.0	12	24.0
1,000-4,999	43	21.2	9	17.3	10	19.6	12	24.0	12	24.0
5,000-9,999	1	0.5	0	.0	0	.0	1	2.0	0	.0
10,000 or more	1	0.5	1	1.9	0	.0	0	.0	0	.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 13

Participant's Sources of Pretraining Pesticide Information

Source of information	Number of times reported
Periodical (farming magazine or newspaper)	175
Pesticide dealers	117
County agents	94
Vo-Ag training	185
Radio	46
Television	158
Other sources	15

Table 14

Frequencies of Reported
Pesticide Applicator
Equipment Usage

Type of Equipment Used	Yes	No	Total
Sprayer	165	38	203
Fogger	12	191	203
Granular spreader	94	109	203
Low pressure sprayer	112	91	203
High pressure sprayer	28	175	203
Air blast or mist sprayer	8	195	203

the participants reported an intent to use pesticides in the future (see Table 15). Thirty-five participants claimed familiarity with the presently proposed EPA pesticide licensure regulations, while 164 claimed little or no knowledge of such (see Table 16). Sixty-nine participants replied "yes" and 131 "no" (see Table 17) when asked, "Should private applicators have to be certified?" However, 190 responded that pesticide usage was warranted and ten thought it was not (see Table 18). Twenty-three participants expressed an opinion that it was not advisable to restrict use of certain pesticides (see Table 19), while 177 said that such restriction was advisable. One person reported himself undecided on this issue.

Procedures

Two weeks before the beginning of the training sessions, each cooperating county extension agent was sent a packet of materials (see Appendix E), including (a) a letter explaining the necessary details of the conduct of the experiment; (b) a sample of a letter to be sent to each participant; (c) a reimbursement record form; and (d) a schedule of testing dates, times and places.

The research training session for each participant consisted of (a) completing a demographic data form (see Appendix F); (b) studying the selected pesticide applicator information under one of the four instructional delivery systems; (c) completion of an attitude scale (see Appendix G); and (d) taking a pesticide knowledge test over the materials studied (see

Table 15

Participants' Responses to:
"Do You Plan to Use
Pesticides in the Future?"

	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
Response	n	%	n	%	n	%	n	%	n	%
Yes	202	99.5	51	98.1	51	100.0	50	100.0	50	100.0
No	1	.5	1	1.9	0	.0	0	.0	0	.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 16

Participants' Pretraining Familiarity with the EPA Pesticide Regulations

	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
Familiar with the EPA regulations?	n	%	n	%	n	%	n	%	n	%
Yes	35	17.2	9	17.3	10	19.6	9	18.0	7	14.0
No	164	80.8	42	80.8	41	80.4	40	80.0	41	82.0
No Response	4	2.0	1	1.9	0	.0	1	2.0	2	4.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 17

Participants' Responses to:
"Should Private Applicators Have to be Certified?"

Should private applicators have to be certified?	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
Yes	69	34.0	20	38.5	18	35.3	16	32.0	15	30.0
No	131	64.5	32	61.5	33	64.7	32	64.0	34	68.0
No Response	3	1.5	0	.0	0	.0	2	4.0	1	2.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 18

Participants' Responses to:
"Is Pesticide Usage Warranted?"

Is pesticide usage warranted?	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
Yes	190	93.6	50	96.2	50	98.0	46	92.0	44	88.0
No	10	4.9	2	3.8	1	2.0	4	8.0	3	6.0
No response	3	1.5	0	.0	0	.0	0	.0	3	6.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Table 19

Participants' Responses to:
"Do you Consider it Advisable to Restrict
Use of Certain Pesticides?"

Do you consider it advisable to restrict use of certain pesticides?	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
Yes	177	87.2	46	88.5	43	84.3	43	86.0	45	90.0
No	23	11.3	3	5.8	8	15.7	7	14.0	5	10.0
Undecided	1	.5	1	1.9	0	.0	0	.0	0	.0
No response	2	1.0	2	3.8	0	.0	0	.0	0	.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

Appendix H). The experiment was conducted from February 18, 1975, through March 14, 1975 (see Appendix I), with instructional delivery systems randomly assigned to participants within and across testing centers (see Table 20), making pretesting unnecessary and eliminating pretest sensitization. Two experimenters and a media specialist, responsible for the conduct of the study at the ten testing centers, constituted the field experimental team. Each of the experimenters conducted five of the experimental training sessions. Subjects within instructional delivery systems were evenly divided between the two experimenters (see Table 21). The same media specialist was present at all ten experimental sessions. All materials and personnel for each session were transported by the experimental team to the experimental centers. A checklist of all needed materials and equipment (see Appendix J) was prepared and carefully checked in preparation for each trip. The room arrangement used at the first experimental center was diagrammed and used as a model at other centers. Any major deviations from this plan were noted and are reported with the model arrangement in Figure 2. A standard set of instructions and communications to participants (see Appendix K) was employed at each testing center.

At each testing center the following set procedure was followed in the actual conduct of the experiment: with all participants present, the demographic data forms were distributed and completed. As a group they were then provided with standardized information on the EPA pesticide regulations,

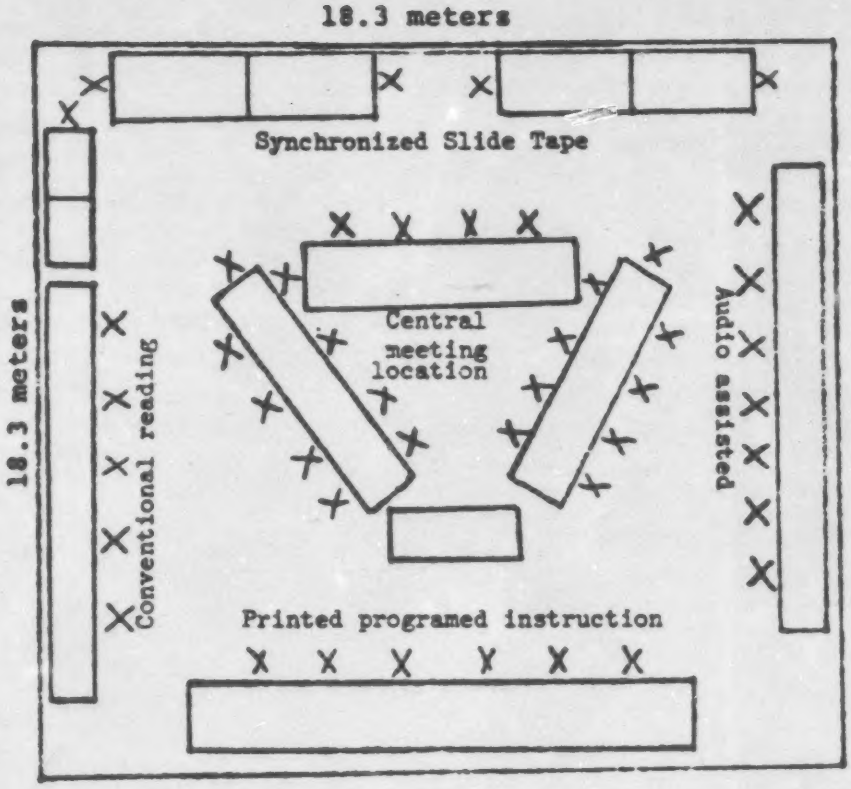

Figure 2. Nebraska pesticide training project room arrangement at Columbus center. (Deviations from above room arrangements at other centers: Wayne - similar arrangement in City Auditorium; Broken Bow - used three rooms, audio assisted and synchronized slide tape in separate rooms; Scottsbluff - separate rooms for each instructional delivery system; Fairbury - two rooms, audio assisted in separate room).

Table 20

Number of Participants within Instructional Delivery Systems by Testing Date

Testing Date	Sample				
	Total	Conventional reading	Printed programed	Audio-assisted	Slide-tape
February 18	19	4	5	5	5
February 19	20	5	5	5	5
February 24	23	7	6	5	5
February 26	21	6	5	5	5
February 28	21	6	5	5	5
March 7	20	5	5	5	5
March 11	22	6	6	5	5
March 12	20	5	5	5	5
March 13	17	3	4	5	5
March 14	20	5	5	5	5
Totals	203	52	51	50	50

Table 21

Participants within Instructional Delivery Systems by Experimenter

	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
Experimenter	n	%	n	%	n	%	n	%	n	%
Experimenter 1	104	51.2	28	53.8	26	51.0	25	50.0	25	50.0
Experimenter 2	99	48.8	24	46.2	25	49.0	25	50.0	25	50.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

the purpose of the project, and the expectations for their participation. Each participant was then assigned a participant number and randomly assigned one of the four instructional delivery systems. The participant identification number and the number of his instructional delivery system were recorded on the demographic data form and these completed forms were collected. An instruction sheet was then presented to the participants and they were reminded that each was studying at his own pace which would vary among the instructional systems and individuals. Participants were then divided into the four study groups and given instructions and aid as needed in using the materials and running the audio visual equipment. The media specialist remained available to the participants throughout the study period. Starting time and ending time for study were recorded for each participant.

Upon completion of study each participant reported to a special testing area and was administered first the attitude scale and then the knowledge test. All instruments were checked for proper identification upon their return. Before leaving the experimental room, each participant was given a personal copy of the conventional reading materials and whatever printed materials he studied.

The completed instruments from each experimental center were checked after the session to find any deviations from the standardized procedure and to assure accurate and complete recording practices. The numerical data were subsequently coded for keypunching and any verbal comments compiled (see Appendix L). After the completion of the total experimental phase of the

project, each participant was sent a copy of the knowledge test with correct responses and the mean and range of total group performance on that test (see Appendix M). Also, at this time, the county agents were sent a debriefing form on the sessions (see Appendix N).

CHAPTER IV

Results

Analysis of Variance (ANOVA)

Knowledge gain. Table 22 presents the frequency distributions of scores on knowledge test for total sample and for each of the four delivery systems. Mean, standard deviation, kurtosis, skew, minimum and maximum score, range, and size of sample for total sample and by delivery system are presented in Table 23. Parallel statistical measures for minutes spent in study are found in Table 24. A one way analysis of variance was performed on overall knowledge test and on knowledge scores for each of the five units embedded in the delivery systems. An examination of where significant differences existed between means was performed with Scheffe' post hoc pairwise comparisons (Cohen, 1971) which are reported with the corresponding analysis of variance (ANOVA). All tests were performed with an alpha level of .05. With an expectation of a medium treatment effect = .05, df = 3, and n = 50, the statistical power for the overall knowledge test is .83 (Cohen, 1971).

Table 25 presents the 1 x 4 ANOVA (Kirk, 1968) performed on the overall knowledge test. The result of this test, $F(3, 199) = 2.15$, was not significant ($p > .05$) i.e., no instructional delivery system produced a significantly better performance on the total knowledge test than any other instructional delivery system. Since this was the case the

Table 22

Frequency Distribution of Scores on Knowledge Test

Number of items correct	Sample									
	Total		Conventional reading		Printed programed		Audio assisted		Slide tape	
	n	%	n	%	n	%	n	%	n	%
10	2	1.0	1	1.9	1	2.0	0	.0	0	.0
11	0	.0	0	.0	0	.0	0	.0	0	.0
12	4	2.0	1	1.9	0	.0	2	4.0	1	2.0
13	5	2.5	0	.0	0	.0	4	8.0	1	2.0
14	9	4.4	2	3.8	1	2.0	5	10.0	1	2.0
15	14	6.9	3	5.8	3	5.9	4	8.0	4	8.0
16	15	7.4	4	7.7	6	11.8	3	6.0	2	4.0
17	13	6.4	4	7.7	5	9.8	2	4.0	2	4.0
18	19	9.4	5	9.6	4	7.8	4	8.0	6	12.0
19	29	14.3	6	11.5	7	13.7	6	12.0	10	20.0
20	11	5.4	2	3.8	2	3.9	3	6.0	4	8.0
21	21	10.3	3	5.8	3	5.9	6	12.0	9	18.0
22	21	10.3	5	9.6	7	13.7	6	12.0	3	6.0
23	18	8.9	6	11.5	7	13.7	2	4.0	3	6.0
24	12	5.9	5	9.6	3	5.9	3	6.0	1	2.0
25	33	1.5	1	1.9	1	2.0	0	.0	1	2.0
26	5	2.5	3	5.8	0	.0	0	.0	2	4.0
27	1	.5	0	.0	1	2.0	0	.0	0	.0
28	1	.5	1	1.9	0	.0	0	.0	0	.0
29	0	.0	0	.0	0	.0	0	.0	0	.0
30	0	.0	0	.0	0	.0	0	.0	0	.0
Totals	203	100.0	52	100.0	51	100.0	50	100.0	50	100.0

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Table 23

Statistics for Scores on Knowledge Test

	Sample				
	Total	Conventional reading	Printed programed	Audio assisted	Slide tape
Mean	19.25	19.87	19.55	18.20	19.36
Minimum	10.0	10.0	10.0	12.0	12.0
Maximum	28.0	28.0	27.0	24.0	26.0
Range	18.0	19.0	17.0	12.0	14.0
Standard deviation	3.55	3.94	3.41	3.57	3.11
Kurtosis	-.47	-.50	-.26	-1.21	-.04
Skewness	-.15	-.20	-.23	-.13	-.11
Number of participants	203	52	51	50	50

Note. Maximum score = 30.

Table 24

Minutes Spent in Study of Materials

	Sample				
	Total	Conventional reading	Printed programed	Audio assisted	Slide tape
Mean	95.03	73.33	86.39	148.64	72.78
Minimum	35.0	35.0	52.0	75.0	50.0
Maximum	203.0	113.0	127.0	203.0	135.0
Range	168.0	78.0	75.0	128.0	85.0
Standard deviation	37.10	17.88	19.08	21.85	21.83
Kurtosis	-.49	-.38	-.77	1.82	.49
Skewness	.72	-.15	.07	-.76	1.10
Number of participants	203	52	51	50	50

post hoc comparisons (Table 26) reveal the mean of no delivery system as significantly greater than any other.

A 1 x 4 ANOVA run on Unit I, Common Pests, was significant $F(3, 179) = 4.36$, $p < .01$ (Table 27). Subsequent Scheffe' post hoc comparisons (Table 28) showed the printed programed and the conventional reading to both be significantly better than the audio assisted system ($p < .05$). No other system was significantly better than any other for teaching the basic materials on common pests.

ANOVA analysis of Unit II, Label Reading (Table 29), was also significant, $F(3, 199) = 15.41$, $p < .001$. Post hoc comparisons presented in Table 30 show all other instructional delivery systems to be superior to audio assisted in teaching label reading materials ($p < .05$).

The Unit III, Calibration, ANOVA (Table 31), was also significant, $F(3, 199) = 7.10$, $p < .001$. Scheffe' pairwise comparisons (Table 32), revealed printed programed and synchronized slide tape to be significantly better than conventional reading for teaching calibration concepts ($p < .05$).

The ANOVA on Unit IV, Environmental Considerations (Table 33), was significant, $F(3, 199) = 4.39$, $p < .01$, and the post hoc comparisons (Table 34) showed audio assisted to be significantly better than printed programed ($p < .05$). No other significant differences were found for teaching environmental considerations materials.

The Unit V, Basic Safety (Table 35), ANOVA was also significant, $F(3, 199) = 4.84$, $p < .01$. Table 36 shows the audio

Table 25

ANOVA on Four Instructional Delivery Systems
Overall Knowledge Test

Source	df	SS	F
Between	3	80.000	2.148
Within	199	2470.250	
Total	202	2550.250	

$p > .05$.

Table 26

Differences Between Means of
Four Instructional Delivery Systems
for Overall Knowledge Achievement Test

		Conventional reading	Printed programed	Slide tape	Audio assisted
	M	19.87	19.55	19.36	18.20
Audio assisted	18.20	1.67	1.35	1.16	
Slide tape	19.36	.51	.19		
Printed programed	19.55	.32			
Conventional reading	19.87				

$p > .05$.

Note. Maximum score = 30.

Table 27

ANOVA on Four Instructional Delivery Systems for Common Pest Unit

Source	df	SS	F
Between Groups	3	27.602	4.364*
Within Groups	199	419.574	
Total	202	447.176	

*$p < .05$.

Table 28

Differences Between Means of Four Instructional Delivery Systems for Common Pest Unit

		Printed programed	Conventional reading	Slide tape	Audio assisted
	M	6.11	6.07	5.60	5.22
Audio assisted	5.22	.89*	.85*	.38	
Slide tape	5.60	.51	.47		
Conventional reading	6.07	.04			
Printed programed	6.11				

*$p < .05$.

Note. Maximum score = 9.

Table 29

ANOVA on Four Instructional Delivery Systems for Label Reading Unit

Source	df	SS	F
Between Groups	3	93.598	15.413*
Within Groups	199	402.809	
Total	202	496.406	

*$p < .05$.

Table 30

Differences Between Means of Four Instructional Delivery Systems for Label Reading Unit

		Conventional reading	Slide tape	Printed programed	Audio assisted
	M	5.51	5.30	5.15	3.78
Audio assisted	3.78	1.73*	1.52*	1.37*	
Printed programed	5.15	.36	.15		
Slide tape	5.30	.21			
Conventional reading	5.51				

*$p < .05$.

Note: Maximum score = 8.

Table 31

ANOVA on Four Instructional Delivery Systems for Calibration Unit

Source	df	SS	F
Between Groups	3	13.308	7.104*
Within Groups	199	124.269	
Total	202	137.577	

*$p < .05$.

Table 32

Differences Between Means of Four Instructional Delivery Systems for Calibration Unit

		Printed programed	Slide tape	Audio assisted	Conventional reading
	M	2.53	2.30	2.26	1.83
Conventional reading	1.83	.70*	.47*	.43	
Audio assisted	2.26	.27	.04		
Slide tape	2.30	.23			
Printed programed	2.53				

*$p < .05$.

Note. Maximum score = 3.

Table 33

ANOVA on Four Instructional Delivery Systems for Environmental Considerations Unit

Source	df	SS	F
Between Groups	3	14.845	4.385*
Within Groups	199	224.584	
Total	202	239.429	

*$p < .05$.

Table 34

Differences Between Means of Four Instructional Delivery Systems for Environmental Considerations Unit

		Audio assisted	Slide tape	Conventional reading	Printed programed
	M	4.72	4.28	4.17	3.98
Printed programed	3.98	.74*	.30	.19	
Conventional reading	4.17	.55	.11		
Slide tape	4.28	.44			
Audio assisted	4.72				

*$p < .05$.

Note. Maximum score = 6.

Table 35

ANOVA on Four Instructional Delivery Systems for Basic Safety Unit

Source	df	SS	F
Between Groups	3	10.024	4.835*
Within Groups	199	137.523	
Total	202	147.547	

*$p < .05$.

Table 36

Differences Between Means of Four Instructional Delivery Systems for Basic Safety Unit

		Audio assisted	Conventional reading	Slide tape	Printed programed
	M	1.96	1.78	1.46	1.43
Printed programed	1.43	.53*	.35	.03	
Slide tape	1.46	.50*	.32		
Conventional reading	1.78	.18			
Audio assisted	1.96				

*$p < .05$.

Note. Maximum score = 3.

assisted system to be significantly better than both printed programed and slide tape in teaching basic safety materials ($p < .05$).

Attitude toward training session. A 1 x 4 ANOVA performed on attitude toward the training program was significant, $F(3, 199) = 5.76$, $p < .001$ (see Table 37). Scheffe' post hoc pairwise comparisons (see Table 38) showed that the subjects who studied under the audio assisted and conventional reading instructional systems had a significantly less positive attitude toward the training session than those who studied the synchronized slide tape system ($p < .05$).

Pearson Product Moment Correlations

Knowledge gain. Pearson product moment correlations (Mahrens & Lehmann, 1973) between knowledge scores (total and by delivery system) and selected subject variables were run at the .05 level (see Table 39). Five variables were selected for this purpose: (a) number of years in farming, (b) age of participant, (c) level of education completed by participant, (d) acres under production, and (e) time spent in study.

Significant negative correlations ($p < .05$) were found between number of years in farming and knowledge scores for total sample ($r = -.31$), conventional reading ($r = -.36$), and slide tape ($r = -.49$). Significant negative correlations also existed for all samples between knowledge gain and age of participant: total ($r = -.33$), conventional reading ($r = -.37$), printed programed ($r = -.30$), audio assisted ($r = -.31$), slide tape)$r = -.45$).

Table 37

ANOVA on Four Instructional Delivery Systems
Attitude Toward Training Program Scale

Source	df	SS	F
Between Groups	3	3017.000	5.764*
Within Groups	199	34723.000	
Total	202	37740.000	

*$p < .05$.

Table 38

Differences Between Means of
Four Instructional Delivery Systems
on Attitude Toward Training Program Scale

		Audio assisted	Conventional reading	Printed programed	Slide tape
	M	62.24	62.44	68.47	71.18
Slide tape	71.18	8.94*	8.74*	2.71	
Printed programed	68.47	6.23	6.03		
Conventional reading	62.44	.20			
Audio assisted	62.24				

*$p < .05$.

Note. Maximum score = 175.

Table 39

Correlation of Knowledge Scores and Selected Participant Variables

Selected Participant Variables	Sample				
	Total	Conventional reading	Printed programed	Audio assisted	Slide tape
Number of years in farming	-.311*	-.358*	-.356*	-.048	-.489*
Age of participant	-.330*	-.365*	-.296*	-.309*	-.454*
Level of education completed by participant	.413*	.449*	.500*	.357*	.366*
Acres under production	.123*	.034	-.108	.428*	-.043
Time spent in study	-.133*	-.092	-.224*	.271*	-.125

*$p < .05$ (Pearson Product Moment Correlations).

Knowledge scores correlated positively ($p < .05$) for all samples with level of education completed by participant: total ($r = .41$), conventional reading ($r = .45$), printed programed ($r = .50$), audio assisted ($r = .36$), slide tape ($r = .37$). Correlations for acres under production with knowledge scores were: total sample ($r = .12$, $p < .05$), conventional reading ($r = .03$, $p > .05$), printed programed ($r = -.11$, $p > .05$), audio assisted ($r = .43$, $p < .05$) and slide tape ($r = -.04$, $p > .05$). Correlations between knowledge scores and time spent in study were as follows: total sample ($r = -.13$, $p < .05$), conventional reading ($r = -.09$, $p > .05$), printed programed ($r = -.22$, $p < .05$), audio assisted ($r = .27$), $p < .05$), slide tape ($r = -.13$, $p > .05$).

Attitude toward training session. The same participant characteristics were correlated with attitude toward training session. Table 40 shows correlations which were significant between attitude toward the training session and these selected variables: (a) number of years in farming for conventional reading sample ($r = -.23$, $p < .05$); (b) level of education completed for slide tape sample ($r = -.25$, $p < .05$); (c) acres under production for total ($r = -.11$, $p < .05$) and slide tape ($r = -.35$, $p < .05$) samples; and (d) time spent in study for total ($r = -.16$, $p < .05$) and audio assisted ($r = -.34$, $p < .05$) samples.

The correlations indicate that for the overall sample, knowledge gain was negatively related to (a) number of years in farming, (b) age of participant and (c) time spent in study, whereas it was positively related to (a) attained formal educational

Table 40

Correlations of Attitude Toward Training Session and Selected Participant Variables

Selected participant variables	Sample				
	Total	Conventional reading	Printed programed	Audio assisted	Slide tape
Number of years in farming	-.020	-.229*	-.052	.166	.152
Age of participant	-.007	-.197	-.087	.143	.199
Level of education completed by participant	-.063	-.145	-.083	.218	-.249*
Acres under production	-.114*	-.115	.022	.077	-.352*
Time spent in study	-.159*	.135	.165	-.340*	.143

*$p < .05$ (Pearson Product Moment Correlations).

level and (b) number of acres under production. These significant correlations were present across all instructional delivery systems only for age of participant and educational level. Significant correlations of these selected variables with attitude toward training session were present (and negative) for total sample only with (a) acres under production and (b) time spent in study. The statistical significance of these correlations did not maintain consistently over the four delivery systems.

Some of these correlations are especially noteworthy. The significant negative correlation for the printed programed sample of knowledge gain with the amount of time spent in study (i.e., the longer the printed programed participant spent studying the greater was his knowledge gain), and the significant positive correlation on the same factors for the audio assisted sample reflect the learning effects of the differential types of control these instructional delivery systems imposed on the learner (see Table 39). The significant negative correlation for the audio assisted sample of time spent in study with attitude toward the training session (see Table 40) shows that although learning improved, attitude toward the training session became less positive with increased time spent in study for this sample.

Multivariate Analysis (MANOVA)

A strength of association test (Kirk, 1968) on the overall knowledge outcome scores showed that 1.66% (ω^2 = .0166) of the variance was due to the instructional delivery system treatment

effects. Since this was the case, a further multivariate analysis of variance (MANOVA) was performed on the data in an attempt to locate where the stronger experimental associations were.

Four independent variables: (a) instructional delivery system, (b) age, (c) education, and (d) attitude toward licensure, were selected as potential factors affecting the three independent variables: (a) knowledge test scores, (b) attitude toward training session, and (c) time spent in study.

MANOVA on knowledge gain. Table 41 presents the MANOVA for knowledge scores. The analysis shows a significant difference on overall knowledge test scores under sequential analysis (i.e., with the effects of the aforementioned factors removed) by (a) instructional delivery system, $F(3, 185) = 2.837$, $p < .05$; (b) age, $F(5, 185) = 7.715$, $p < .001$; (c) education, $F(7, 185) = 5.600$, $p < .001$. Attitude toward licensure requirement, $F(2, 185) = .025$ was not significant ($p > .05$) for sequential analysis. The partial analysis, which ignores the effects of the other three sources of variance, revealed the same factors to be significant for overall knowledge achievement as shown by sequential analysis: (a) instructional delivery system, $F(3, 185) = 3.983$, $p < .05$; (b) (b) age, $F(5, 185) = 3.130$, $p < .05$; (c) education, $F(7, 185) = 5.567$, $p < .001$, and (d) attitude toward licensure, $F(2, 185) = .025$, $p > .05$. Although the multivariate theory for post hoc examination of means is not well developed, an examination of the post hoc comparisons (see Table 26) for the univariate test of the same data indicates that, although not significantly so,

Table 41

MANOVA on Overall Knowledge Achievement Test

Source	df	Sequential SS	F	Partial SS	F
Instructional delivery system	3	79.982	2.837*	112.301	3.983*
Age	5	362.559	7.715*	147.074	3.310*
Education	7	368.405	5.600*	366.290	5.567*
Attitude toward licensure	2	.463	.025	.463	.025
Error	185				

*$p < .05$.

Note. $N = 203$; $M = 19.25$; $SD = 3.55$.

conventional reading, printed programed and slide tape were better than the audio assisted. (Note that when the effects of age, education and attitude toward licensure are considered, as above described for MANOVA test, significant differences do exist for instructional delivery system.) The aforementioned correlations, negative for age with knowledge gain and positive for educational level with knowledge gain, bear out this evidence (see Table 39).

MANOVA on attitude toward training session. Instructional delivery system $F(3, 185) = 5.856$, $p < .001$ (sequential); 5.752, $p < .001$ (partial) was a significant factor in the participant's attitude toward the pesticide training session. Age, educational level, and attitude toward licensure were not significant contributors in attitude toward the training session (see Table 42). Inspection of Table 38 indicates the size of the differences between means and suggests where significant differences are present for the MANOVA analysis, too.

MANOVA on time spent in study. Table 43 indicates instructional delivery system, $F(3, 185) = 170.523$, $p < .001$ (sequential) 157.018, $p < .001$ (partial) and age, $F(7, 185) = 3.097$, $p < .01$ (sequential), 2.175, $p < .05$ (partial) to be significant factors in MANOVA analysis of time spent in study. Table 24 indicates that audio assisted participants spent approximately twice as much time in study ($M = 148.64$ minutes) as conventional reading ($M = 73.33$) and slide tape ($M = 72.78$) participants. Printed programed participants averaged 86.39 minutes in study.

Table 42

MANOVA on Attitude Toward
Instructional Delivery Systems Training Session

Source	df	Sequential SS	F	Partial SS	F
Instructional delivery system	3	3017.258	5.856*	2963.954	5.752*
Age	5	1266.700	1.475	1178.303	1.372
Education	7	849.122	.706	878.118	.730
Attitude toward licensure	2	831.454	2.420	831.454	2.420
Error	185	31774.758			

*$p < .05$.

Note. $N = 203$; $M = 66.08$; $SD = 13.67$.

Table 43

MANOVA on Minutes Spent in Study of Instructional Delivery System

Source	df	Sequential SS	F	Partial SS	F
Instructional delivery system	3	196753.178	170.523*	181170.486	157.018*
Age	5	5957.064	3.097*	5221.876	2.715*
Education	7	3195.796	1.187	3186.314	1.184
Attitude toward Licensure	2	942.645	1.225	942.645	1.225
Error	185	71152.194			

*$p < .05$.

Note. $N = 203$; $M = 95.03$ $SD = 37.10$.

Educational level and attitude toward licensure were not significant factors contributing to amount of time spent in study (see Table 43).

County Agent Post Workshop Evaluations

Response frequencies of county agents to a five point post workshop evaluation scale (highest rating = 1.00 and lowest rating = 5.00) are presented in Table 44. Each of the dimensions averaged as follows: (a) overall program ($\underline{M}$ = 2.16), (b) organization and presentation ($\underline{M}$ = 1.71), (c) quality of materials ($\underline{M}$ = 2.14), (d) participant satisfaction ($\underline{M}$ = 2.14), and (e) quality of learning experience ($\underline{M}$ = 2.43). The average for the organization and presentation of the training session was in the "superior" rating category and all other dimensions averaged an "excellent" rating. Table 45 indicates that six county agents selected the printed programed system as "useful" to them for training pesticide applicators. Conventional reading and slide tape were each rated "useful" by three county agents while audio assisted was rated "useful" once.

Cost/Benefit Analysis

Table 46 presents the overall production and equipment costs for preparation of presentation sets per instructional delivery system. The costs exclude researcher time spent in locating and coordinating content included in the training session. All other personnel costs which went into the actual production of the materials are included.

Other costs to be considered in the use of these instructional delivery systems are: (a) maintenance of equipment,

Table 44

Agricultural Extension Agents
Instructional Delivery System Selection for
Training Pesticide Applicators

Program aspect	Frequency of rating selection					
	Superior	Excellent	Good	Fair	Poor	No Response
Overall program	0	5	1	0	0	1
Organization of presentation	3	3	1	0	0	0
Quality of materials	1	4	2	0	0	0
Participant satisfaction	0	6	1	0	0	0
Quality of learning experience	0	4	3	0	0	0

Note. Number of county agents responding = 7.

Table 45

Agricultural Extension Agents
Ratings of Instructional Delivery System as
"Useful" for Training Pesticide Applicators

Instructional delivery system	Frequency of "Useful" rating
Conventional reading	3
Printed programed	6
Audio assisted programed	1
Synchronized slide tape	3

Note: Number of county agents responding = 7.

Table 46

Preparation Costs of Presentation Materials

Instructional delivery system	Production cost	Equipment cost	Total cost	Number of sets of materials produced
Conventional reading	$1293.78	$ ---	$1293.78	300
Synchronized slide tape	2047.67	2251.90	4299.57	5‡
Audio assisted	1347.82	255.43	1603.25	15‡ 250
Printed programed	1807.94	---	1807.94	250

‡ indicates non consumable materials.

(b) need for a technician, (c) replacement of consumable materials, and (c) space provisions required for studying by each instructional delivery system. Both actual benefits (as indicated by knowledge gain and time efficiency analyses) and perceived usefulness (as indicated by county agents' evaluation of relative usefulness of the different media in Table 45) need to be considered in ascertaining the relative cost/benefit of each instructional delivery system for a specified population in its unique setting. The projected number of consumers who would be serviced for the life of the program, availability of space, availability of required technical assistance and other local considerations also become relevant cost/benefit factors when considering the adoption of an instructional delivery system.

CHAPTER V

Summary, Conclusions, and Recommendations

Knowledge Gain Summary and Conclusions

The analysis of variance run on the overall knowledge test (see Table 25) failed to reject the null hypothesis of no significant differences among the four instructional delivery systems: (a) conventional reading, (b) slide tape, (c) printed programed and (d) audio assisted. Since a strength of association test indicated that only 1.66% of the variance was due to instructional delivery system treatment effects, a multivariate analysis including the factors of (a) instructional delivery system, (b) age, (c) educational level, and (d) attitude toward licensure requirement was conducted for the independent variable, knowledge gain, in an attempt to isolate associations between knowledge gain and these factors. For this test (a) instructional delivery systems, (b) age and (c) education were significant factors contributing to the knowledge gain (see Table 41). Hence partialing out the effects of additional factors with a multivariate analysis indicates a less conservative interpretation of differences due to instructional delivery systems. Post hoc analyses for multivariate tests are not yet perfected; however, inspection of size of differences between means (see Table 47) reveals probable significant differences: conventional reading, printed programed and slide tape means are notably larger than the audio assisted mean. Hence, these three instructional delivery systems (in the order listed) appear to have taught the overall content better than the audio assisted system.

Table 47

Means for Knowledge Achievement,
Time Spent in Study and Attitude Toward Training Session

Sample	Knowledge achievement	Attitude toward training session	Minutes in study
Conventional reading	$\underline{M}$ = 19.87 $\underline{SD}$ = 3.94	$\underline{M}$ = 62.44 $\underline{SD}$ = 12.67	$\underline{M}$ = 73.33 $\underline{SD}$ = 17.88
Printed programed	$\underline{M}$ = 19.55 $\underline{SD}$ = 3.41	$\underline{M}$ = 68.47 $\underline{SD}$ = 12.54	$\underline{M}$ = 86.39 $\underline{SD}$ = 19.08
Audio assisted	$\underline{M}$ = 18.20 $\underline{SD}$ = 3.57	$\underline{M}$ = 62.24 $\underline{SD}$ = 13.82	$\underline{M}$ =148.64 $\underline{SD}$ = 21.85
Slide tape	$\underline{M}$ = 19.36 $\underline{SD}$ = 3.11	$\underline{M}$ = 71.18 $\underline{SD}$ = 13.79	$\underline{M}$ = 72.78 $\underline{SD}$ = 21.83
Total	$\underline{M}$ = 19.25 $\underline{SD}$ = 3.55	$\underline{M}$ = 66.08 $\underline{SD}$ = 13.67	$\underline{M}$ = 95.03 $\underline{SD}$ = 37.10

Five units of material were included in the training package containing information on: (a) common pests, (b) label reading, (c) calibration, (d) environmental considerations, and (e) basic safety. Since it would be useful to know if any instructional delivery system taught some types of materials better than other instructional delivery systems, knowledge gain was analyzed for each unit separately. Results for each unit were significant (see Tables 27-36): (a) Common pests materials were taught significantly better by printed programed and conventional reading than by audio assisted (see Table 28); (b) Label reading was taught significantly better by audio assisted than by the other three delivery systems (see Table 30); (c) Calibration was taught better by printed programed and slide tape than by conventional reading (see Table 32); (d) Environmental considerations material was taught better by audio assisted than by printed programed (see Table 34); (e) Basic safety was taught better by audio assisted than by printed programed or slide tape (see Table 36).

Although significant differences are present in these within unit findings, no clear cut indication of the superiority of one type of teaching device over another is indicated for specific types of materials, i.e. arithmetic calculation, visual displays, or verbal instruction.

Some evidence is present that materials requiring identification of specific pests or label cues were not learned as well under the audio assisted system but that materials requiring attention to information on environmental factors and basic safety

were better learned by the audio assisted system. It could be hypothesized that the quality of attention required by the audio assisted system did not result in the level of learning present for the printed programed and conventional reading where specific information and detail of less familiar facts were required (e.g., calibration and identification of insects), but that the extended length of attention required for listening to the audio assisted instruction in its entirety was helpful in learning material with which the participant had more day to day familiarity (e.g., environmental considerations and basic safety). Alternate interpretations, however, are also possible: (a) Very little real difference exists and the apparent differences are due to alpha inflation. (b) The apparent differences are artifacts of an insufficient number of testing items within each unit to ascertain real differences. (c) Lack of parallel test item difficulty across units resulted in the differences. (d) The order of unit presentation to participants was not randomized, and, therefore, effects due to order of presentation by instructional delivery system are potentially present (e.g., warm-up time, fatigue, etc.). Further investigation of this issue through isolating and measuring these factors is indicated.

Attitude Toward Training Session Summary and Conclusions

The univariate analysis and subsequent post hoc analysis performed on attitude toward training session shows that those participants who studied the slide tape delivery system were significantly more positive toward the training session than those who studied the audio assisted or conventional reading

instructional system (see Table 38). The multivariate analysis indicates that of the four factors included (instructional delivery system, age, educational background and attitude toward licensure) only instructional delivery system was a significant contributor to attitude toward training session (see Table 42). Correlations between time spent in study and attitude toward training session reveal a significantly negative correlation for the total sample and the audio assisted sample (see Table 40). Hence, it seems reasonable to assume that the comparatively greater amount of time required for completion of study materials contributed strongly toward the less positive attitude of audio assisted sample.

Time Spent in Study Summary and Conclusions

Comparison of the means for time spent in study (see Table 47) indicates that the audio assisted sample spent approximately twice as much time with study materials as did any other sample. The multivariate analysis (see Table 43) indicates that both instructional delivery system and age were significant factors in the amount of time spent in study. As indicated above, a significant ($p < .05$) negative correlation was present for the audio assisted sample between time spent in study and attitude toward the training session (see Table 40). All other sample correlations for time spent in study were positive but not significant. Knowledge gain correlations indicate that only for the audio assisted sample was there a positive correlation between time spent in study and knowledge gain ($p < .05$). All other samples indicate an inverse relationship between knowledge gain and time spent in study but this was significant ($p < .05$) only for the

printed programed sample. Indications are present that there was a positive relationship between the amount of time spent in study and attitude toward the training program, except for the audio assisted sample. It is hypothesized that since the audio assisted system required approximately twice as much time to complete as the other systems, attitudes toward the training session experience were significantly affected in a negative direction. It needs to be noted, too, however, that within the audio assisted group those who spent more time studying attained higher knowledge gain scores but that this relationship was inverse for all other instructional delivery systems (see Table 39). These results could be an artifact of differential interest or fatigue levels of the participants within the audio assisted system with participants possessing higher interest or lower fatigue levels persisting more successfully through the training materials and subsequent testing items. However, since longer study time seemed to result in lower knowledge scores for the other samples, it is also possible that the structure of the audio assisted system sustained learning in spite of fatigue factors.

Summary Recommendations

When factors of (a) knowledge achievement, (b) attitude toward training session and (c) time spent in study (see Table 47) are all considered, the most obvious finding of this study is that the audio assisted instructional system is least efficient in terms of (a) knowledge gain (it produced the least gain), (b) attitude toward training (participants were least positive),

and (c) time efficiency for the learner (approximately twice as much time was required to complete the instruction). Since the cost analysis indicates no advantage over the other systems (see Table 46), it appears that the audio assisted instruction as here employed was not as efficient a method of instruction for this population of adult learners under the given circumstances as conventional reading, printed programed or slide tape. Table 45 indicates that the extension agents, who administer learning programs for this population, would least frequently select the audio assisted system. It is recommended that the adult educator consider the factors and evidence herein and employ similar audio assisted instruction only if very clear advantages are present for his/her situation.

The findings also evidence the power of learning materials to control behaviors such as time spent in study, attitudes, and learning. The adult educator is well advised to study through the various findings in preparation for decision making on what constitutes efficient programing for adult learners. Taking into consideration such factors as the significant effects of (a) age and instructional delivery system on time spent in study (see Table 43), (b) education, age and instructional delivery system on knowledge gain (see Table 41), and (c) instructional delivery system on attitude (see Table 42) could assist the adult educator in making judicious decisions when any of these factors are particularly relevant.

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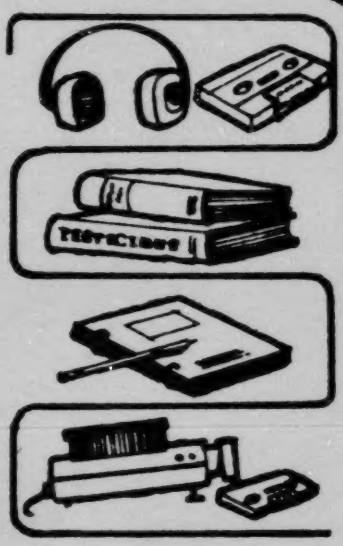
Pesticides Applicator TRAINING PROJECT...



Conventional Reading Materials

1975

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL REBOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE
J. L. ADAMS, DIRECTOR

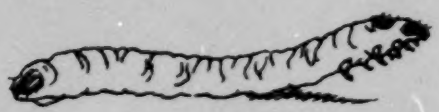
UNIT I
COMMON PESTS

(INSECTS DESTRUCTIVE TO CORN AND SORGHUM)

Insects That Attack Plants Below Ground

I-1 Corn Rootworm (Larvae)

I-1.1 Description and Damage: Larvae (worms) are white with a dark head and dark spot on the top of the tail. Almost microscopic at hatch, they grow to about 1/2 inch long when fully developed. Larvae of all species are similar in appearance.



Corn rootworm larval damage is most likely to occur in continuous corn production fields. The young larvae tunnel inside corn roots, chewing them off as the larvae grow larger. Corn following other crops may be damaged by the larvae if adult populations in adjacent cornfields were numerous the previous August.

I-1.2 Life History: Western and northern corn rootworms lay eggs in the late summer, depositing most eggs from the first of August through the first half of September. Eggs overwinter in the soil, hatching the following spring. Soil temperature and possibly moisture will delay the time of hatch. Normally, eggs hatch in late May or early June; however, cool springs may delay hatch. The larvae feed for about 30 days before pupating.

I-1.3 Control: Rotation is considered an effective prevention for rootworms, and soil insecticides are not necessary in most situations. However, in continuous corn production fields, insecticide application at planting or post-olant is indicated, if one or more beetles per plant were observed the previous August.

Chemicals recommended for planting application are: Dasanit 15G, Dyfonate 10G, Dyfonate 20G, Furadan 10G, Thimet 15G, Landrin 15G.

Post emergent measures include: Bux 10G, Dasanit 15G, Dyfonate 10G, Dyfonate 20G, Diazinon 14G, Di-Syston 15G, Furadan 10G, and MOCAP 10G.

I-2
Cutworms
I-2.1
Description and Damage:

Black cutworm larvae are grayish to black in color.

They cut into small plants at or below the soil line and will chew into larger plants below soil line causing the plant to die. Most feeding is done at night. When soil is very dry near the surface, feeding is generally below the surface near the moist soil. During the day, the larvae can be found curled under the soil surface near a freshly cut plant.

Sandhills cutworms are light colored. The damage is very much like that caused by black cutworms, but usually restricted to sandy soils.

I-2.2
Life History:

Most cutworms overwinter as fully grown worms or pupae in the soil. Moths emerge in the spring. Black cutworm moths deposit eggs most frequently on grasses, weeds, or other plants in low or damp areas, thus their common name, "overflow" cutworm. There are probably two generations every year.

Destructive populations of the sandhills cutworm occur in Valentine sands or blow-sands with sharp decreases in numbers on loamy or sandy loams.

I-2.3
Control:

Corn following sod or stubble is most likely to be damaged by cutworms. Continuous, clean cultivated corn is a deterrent to cutworm infestations, except in low-land fields that have a history of cutworm infestations.

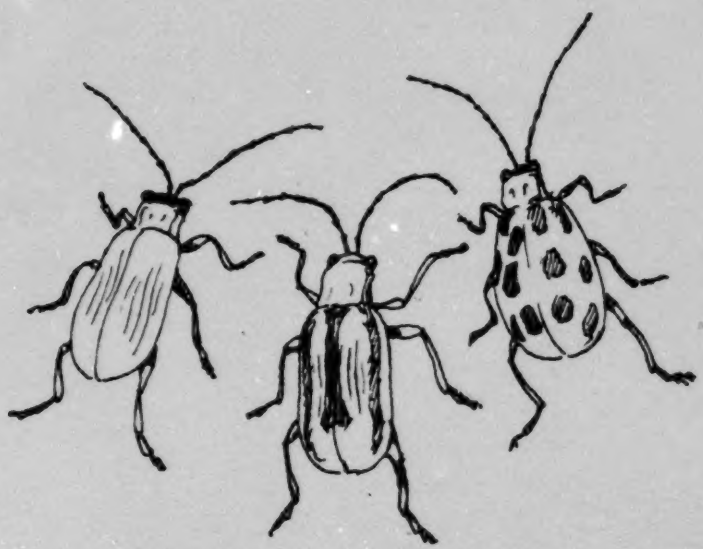
Chemical controls suggested are: Aldrin (2 pounds per acre), Heptachlor (2 pounds per acre), or Chlordane (4 pounds per acre), used before planting; or Aldrin (1 pound per acre), Heptachlor (1 pound per acre), or Chlordane (2 pounds per acre), row-sprayed at planting.

Sevin 5% bait is effective only when cutworms are 1/2 inch or less long, and soil is moist on surface.

Insects That Attack Plants Above the Soil

I-3 Corn Rootworm Adults

I-3.1 Description and Damage: The adults (beetles) of western corn rootworms are black and yellow. The color pattern will vary from distinct stripes to almost black with a yellow tip on the rear of the wing covers. Northern corn rootworm adults



are tan to green in color without distinct stripes or spots. They are slightly smaller than western and southern rootworm adults. Southern corn rootworms are yellow to greenish with six black spots on each side of the wing cover. They are also known as spotted cucumber beetles.

Corn rootworm adults can damage corn by feeding extensively on silks at the time pollen is being produced, and are most likely to be a problem in late planted corn.

I-3.2 Life History: Western and northern corn rootworm adults emerge from the pupae about the first of July in southern Nebraska, and soon after that date in the northern counties. Southern corn rootworms overwinter in the adult stage, probably in states south of Nebraska. Adults migrate north in the spring to deposit eggs in the soil.

I-3.3 Control: Controls are indicated when severe silk chewing is occuring at 25 to 50 percent pollen shed. Suggested are: Sevin, ethyl or methyl parathion, EPN, Malathion, Malathion ULV, and Gardona, with applicable restrictions.

I-4
European Corn Borers
I-4.1
Description and Damage:

Adult corn borers are buff-colored moths that resemble many other kinds of night-flying moths. They are triangular-shaped at rest and about the size of a suit coat button. Eggs are small, round, and flat. They are laid in masses, overlapping much like small fish scales. Masses are about the size of the nail of the small finger. The eggs are white when first laid, but as the small borers develop inside the eggs, they darken.

Newly hatched borers are very small, about 1/16 inch long, white-colored with a dark head. As they grow, they may become darker, almost grayish in color, but most remain light colored. Small dark spots can be observed on borers.

I-4.2 The first brood of borers, usually in late June and early July, feeds on the leaf surface in the whorl of plants, leaving a "shot-hole" appearance on leaves as they emerge from the whorls. When half grown, the borers enter the stalks.

I-4.3 In August, second brood borers often feed on pollen, leaf surfaces, in leaf mid-veins, or axils or leaves before boring into the stalks and cobs. Second brood borers often attack the plants extensively at the ear shanks, in the ears, and the ear zone.

First brood borers reduce yield, but second brood borers cause most visible damage in broken stalks and fallen ears at harvest time.

I-4.4
Life History:

European corn borers spend the winter in the borer stage in corn stalks, and stalks of many other plants. In the spring the borer changes to a pupa, usually in May and early June. The moth emerges from the pupa in late May and early June. First brood borers begin to complete their feeding cycle and to pupate

in July and early August. Second brood moths emerge in late July and August, and they prefer late-planted corn upon which to deposit eggs. After completing their feeding cycles, second brood borers hibernate in infested stalks.

I-4.5
Control:

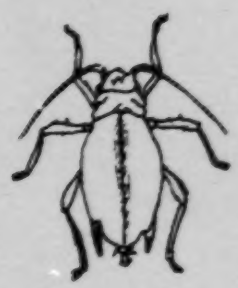
Apply chemical controls when first brood corn borer larvae are present in 50 percent of corn plants that are 36 inches or higher in extended leaf height. There is no reliable guide to the necessity for control of second brood borers; consider an early harvest if second brood borers appear to be present in large numbers, to reduce field loss.

Chemicals suggested are: Diazinon 14G, EPN 4G, Thimet 10G, Thimet 15G, Furadan 10G, Sevin 80 WP, EPN (4 lbs/gal - commercial application), and Diazinon AG 500.

I-5
Greenbugs

I-5.1
Description and Damage:

Light green or greenish-yellow with a narrow darker green stripe down the center of the back. Feet black, legs green. Small "pipes" near the tail are green with black tips.



Greenbugs usually develop on the undersides of leaves, soon killing small plants. The first evidence is yellowing, then browning of plants. Colonies developing on the undersides of leaves will cause reddish-brown spots visible from above.

I-5.2
Life History:

The infestation of sorghum plants starts when winged forms of greenbugs arrive from states south of Nebraska in May and early June, the wind being the primary method of movement. The winged forms are all female and reproduce after settling on the sorghum plants. The young are all females and are born alive; most are wingless and remain on the plant. Seven days after birth they mature and begin to reproduce. Most greenbugs produce two or

three young a day for a period of fourteen days. Due to the fact that the young begin to produce more young in seven days and most remain on the plant, immense populations can develop in a short period of time.

As numbers become high, a small percentage of new greenbugs develop wings and fly or are blown to other fields. Large flights of greenbugs from local infestations usually occur about mid-July.

I-5.3 Reproduction continues through the summer until a tiny wasp called a Lysa wasp deposits eggs in the greenbugs' bodies. The larva of the wasp kills the greenbugs, forming brown "mummies," and thus controlling greenbug infestations frequently in late July and early August. After sorghum matures, greenbugs usually disappear, most of them being killed by parasites or lack of food plants. Greenbugs are not found after the first long period of freezing, about February 1st for most years.

I-5.4
Control:

The young plant (emergence to 6 inches) should be treated when visible yellowing is noticed, with greenbugs on lower leaves. The 6-inch to pre-boot plant should be treated before any entire leaves are killed. The pre-boot and larger plant should be treated when greenbug numbers are sufficient to cause loss of function of 3 or more lower leaves, and parasitism is less than 20 percent.

Control chemicals: Dimethoate 267 (1 pint per acre), Malathion 57% EC (1 1/2 pint per acre), Diazinon AG 500 (1 pint per acre), Di-Syston 15% G (3 1/2 to 6 lbs. per acre), and Thimet 15% G (3 1/2 to 6 lbs. per acre). Granules appear to be more effective than sprays. When using sprays, contact is necessary for good control.

UNIT II
LABEL READING

II-1
Why Read the Label?

You are likely to misuse a pesticide product if you fail to thoroughly read and understand the label. Misuse of a pesticide means: (1) you are in violation of a law; (2) you may endanger the health and well-being of yourself, your family, and your employees; (3) your actions could cause significant detrimental effects on the environment; and (4) your insurance may become void.

Labels are actually not hard to read. They often contain technical words, and the print may be small, but they usually contain words that are already familiar to you. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires that certain information must appear on pesticide labels. The most important information is described below.

II-2
Active and Inert Ingredients:

There are two sections, divided so that you can quickly see what the active ingredients are. The active ingredients can be indicated by a chemical name or common name and the percentage of each. Inert ingredients contain such things as emulsifiers and other material which do not have proven insecticidal effectiveness. All active and inert ingredients must total 100%.

Livestock, Crops, Buildings, and Ornamentals
ACTIVE INGREDIENT: 50%
*Methoxychlor, Technical
INERT INGREDIENTS 50%
*50% Methoxychlor, Technical is equivalent to 44% 2,2-bis (p-methoxyphenyl)-1,1,1-trichloroethane and 6% other isomers and reaction products.

II-3
Hazard Statement:

Required on every label are precautionary statements, which must state clearly the particular dangers involved in the use of the pesticide product. The precautions to be taken to avoid accident, damage, or injury are also given.

Signal words, such as DANGER/POISON, WARNING, or CAUTION indicate the toxicity category of the pesticide. Toxicity means "how poisonous." The signal word on the label will tell the user whether the chemical is highly toxic (DANGER/POISON); moderately toxic (WARNING); slightly toxic (CAUTION); or relatively non-toxic (no signal word required).

II-4 The first example is a product in Category I. The label bears (1) a skull and crossbones and the word POISON; (2) the signal word DANGER, the sentence KEEP OUT OF REACH OF CHILDREN, and an appropriate warning statement; (3) an antidote statement; (4) emergency first-aid instructions that can be followed by a layman; and (5) the instructions, "Call a physician at once in all cases of suspected poisoning."

LANNATE® L

METHOMYL INSECTICIDE

Water Soluble Liquid

1 GALLON CONTAINS 1.8 LBS. METHOMYL

ACTIVE INGREDIENT: **24%**

Methomyl
S-methyl-N-[(methylcarbamoyl)oxy] thioacetimidate

INERT INGREDIENTS: **76%**

U.S. Pats. 3,576,834 & 3,639,633

EPA Reg. No. 352-370-AA

Keep out of reach of children.

DANGER ☠ POISON

Flammable • Contains Methanol

May be fatal or cause blindness if swallowed • Poisonous if inhaled • Causes eye damage • Do not breathe vapors or spray mist. • Do not get in eyes, on skin, on clothing.

Use with adequate ventilation. • Keep away from heat, sparks, and open flame. Keep container closed.

In case of contact, wash skin with plenty of soap and water; for eyes, flush with water for 15 minutes and get medical attention; remove and wash contaminated clothing before re-use.

B-21095 10-73

ANTIDOTE AND FIRST AID

Atropine is an antidote—consult physician for emergency supply of 1/100 grain Atropine tablets. Call a physician at once in all cases of suspected poisoning.

If swallowed, give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. **If inhaled**, remove from exposure. Have patient lie down and keep quiet. If patient is not breathing, start artificial respiration immediately. **Never give anything by mouth to an unconscious person.**

If warning symptoms appear (See **warning symptoms** below), before physician arrives, immediately swallow two atropine tablets (each 1/100 gr.); thereafter, every 10 to 15 minutes, take one atropine tablet (1/100 gr.) until throat becomes dry and skin becomes dry and flushed. Take additional tablets as necessary to maintain a moderately dry throat and dry, flushed skin until physician arrives.

NOTE TO PHYSICIAN

Warning Symptoms—Methomyl poisoning produces effects associated with anticholinesterase activity which may include weakness, blurred vision, headache, nausea, abdominal cramps, discomfort in the chest, constriction of pupils, sweating, slow pulse, muscle tremors.

Treatment—Atropine sulfate should be used for treatment. Administer repeated doses, 1.2 to 2.0 mg. intravenously every 10 to 30 minutes until full atropinization is achieved. Maintain atropinization until the patient recovers. Artificial respiration or oxygen may be necessary. Allow no further exposure to any cholinesterase inhibitor until recovery is assured.

Do not use morphine or 2-PAM.

II-5
Products in Category II are classed as in the range of one-tenth as toxic as those in Category I. These are moderately toxic. The skull and crossbones and the word POISON are <u>not</u> required on the label. The signal word is WARNING, and the label must bear the sentence "Keep Out of Reach of Children." An appropriate warning statement and Note to Physician follow.

WARNING **Keep Out of Reach of Children**

HARMFUL OR FATAL IF SWALLOWED.
SKIN CONTACT OR INHALATION OF DUSTS MAY BE HARMFUL.

Do not get on skin, in eyes, on clothing. Avoid breathing dust. Wear gloves when handling. In case of contact, wash immediately with soap and water. Always wash thoroughly after handling.

NOTE TO PHYSICIANS: Exposure may cause cholinesterase inhibition. Atropine is antidotal. 2-PAM also is antidotal when administered early, and in conjunction with atropine.

II-6
Products in Category III are classed as in the range of one-tenth as toxic as those in Category II. These are slightly toxic. Their labels must bear the signal word CAUTION, the sentence "Keep Out of Reach of Children," and an appropriate caution statement.

CAUTION
KEEP OUT OF REACH OF CHILDREN
CONTENTS UNDER PRESSURE
INJURIOUS TO EYES
HARMFUL IF SWALLOWED

Do Not Get In Eyes • Avoid Breathing Spray Mists • Harmful If Swallowed • Wash Hands Thoroughly After Using • Avoid Contamination of Food and Feedstuffs • Do Not Puncture • Keep Away from Heat; Store At Room Temperature • Never Throw Container Into Fire or Incinerator • Destroy Container When Empty.

In case of human eye contact, flush eyes immediately with plenty of water and get prompt medical attention.

II-7
Products in Category IV are classed as in the range of one-tenth as toxic as those in Category III. These have little toxicity and may not require a caution or antidote statement. Some may be irritating to the skin, nose and throat, or eyes; if so, their labels carry this information. The sentence "Keep Out of Reach of Children" is found on Category IV labels.

MARLATE® 50

METHOXYLCHLOR INSECTICIDE

WETTABLE POWDER
For Dairy and Beef Cattle and Certain Other Livestock Crops, Buildings, and Ornamentals

ACTIVE INGREDIENT: 50%
*Methoxychlor, Technical

INERT INGREDIENTS 50%

*50% Methoxychlor, Technical is equivalent to 44% 2,2-bis (p-methoxyphenyl)-1,1,1-trichloroethane and 6% other isomers and reaction products.

Keep out of reach of children.

Wash thoroughly after handling.

EPA Reg. No. 352-75-AA

II-8
Directions for Use:

Directions for use of a pesticide product tell: (1) where to apply; (2) how much to mix; (3) how much to use; (4) the pests to be controlled; and (5) what forms of application to use. See the example given below.

SOIL INSECTS CONTROLLED

Cabbage maggot
Garden symphylan
Onion maggot
Rootworms:
Northern corn rootworm
Southern corn rootworm
Western corn rootworm
Wireworms:
Corn wireworm
Pacific Coast wireworm
Southern potato wireworm
Sugar beet wireworm
Tobacco wireworm
Western field wireworm
Wheat wireworm

DIRECTIONS FOR USE

Application should be made only with tractor mounted spray equipment and by trained personnel only, using approved protective equipment. Pour the recommended amount of DYFONATE 4-E into nearly filled spray tank. Add balance of water to full tank. Keep agitator running during filling and spraying operations. Apply in 20 to 50 gallons of water per broadcast acre using a properly calibrated, low pressure sprayer having good agitation.

Broadcast applications should be mixed (incorporated) into the soil to a depth of 2 to 3 inches.

RECOMMENDATIONS

BEANS, GREEN AND DRY (except LIMA BEANS): For control of garden symphylans and wireworms, apply 2 quarts (for symphylans) or 1 gallon (for symphylans and wireworms) DYFONATE 4-E per acre, broadcast prior to planting and incorporate into the soil by discing.

COLE CROPS (BROCCOLI, BRUSSELS SPROUTS, CABBAGE, CAULIFLOWER):

Broadcast application for control of garden symphylans — Prior to or at time of seeding or transplanting, apply 2 quarts DYFONATE 4-E per acre, broadcast, and incorporate into the soil by discing.

Drench application for control of cabbage maggot (Use limited to northeastern U.S. only) — For transplant cole crops. Use 1 to 2 quarts DYFONATE 4-E in 200 to 400 gallons of water per acre. Apply with a sprayer equipped with drop nozzles to direct a drenching spray to the base of the plants. Apply immediately after transplanting.

CORN (FIELD, SWEET, AND POPCORN):

A. Band application for control of northern and western corn rootworms —
Apply, at planting, ¼ to 1 quart DYFONATE 4-E per acre in a 6 to 8 inch band over corn rows 38 to 40 inches apart. Incorporate into the top ½ to 1 inch of soil by making application ahead of the press wheels or by use of special covering devices or by dragging a short length of chain behind the press wheels.

B. Broadcast application for control of symphylans and wireworms —
Apply 2 quarts (for symphylans) or 4 quarts (for symphylans and wireworms) DYFONATE 4-E per acre prior to planting and incorporate into the soil by discing.

C. Split boot application for control of northern and western corn rootworms (recommended in the northcentral and midwestern corn-growing areas only) —
Apply, at planting, 1 quart DYFONATE 4-E in 5 to 20 gallons of fluid fertilizer per acre (40 inch row spacing) in subsurface split bands on each side of the corn row.
The fluid fertilizer selected must be physically compatible with DYFONATE 4-E. A compatibility test procedure is available at your Stauffer dealer.

MINT (PEPPERMINT, SPEARMINT): For control of garden symphylans apply 2 quarts DYFONATE 4-E per acre, broadcast, and incorporate into the soil by discing prior to planting or on established plantings prior to spring growth. (Do not apply to mint within 14 days of sinbar application.)

BULB ONIONS: For control of onion maggot, apply as a furrow treatment at time of seeding. Based on a 20 inch row spacing, apply at a rate of 1 quart DYFONATE 4-E per acre (1 quart per 26,109 feet of row; 3/4 fluid ounces per 2,610 feet of row; 1¼ fluid ounces per 1,000 feet of row). Use on organic soils only (soils containing 10% or more organic matter).

POTATOES (IRISH): For control of garden symphylans and wireworms, apply 2 quarts (for symphylans) or 4 quarts (for symphylans and wireworms) DYFONATE 4-E per acre, broadcast, prior to planting and incorporate into the soil by discing.

STRAWBERRIES: For control of symphylans apply 2 quarts per acre, broadcast, and incorporate into the soil by discing prior to planting.

SUGARCANE: At planting: For wireworm control, apply 4 quarts DYFONATE 4-E per acre in a 14 inch band on cane rows 60 inches apart. This is equivalent to 11 to 14½ fluid ounces of DYFONATE 4-E per 1,000 linear feet of row. Apply over the top of sugarcane seed pieces immediately ahead of covering discs.

SUGAR BEETS: For control of garden symphylans and wireworms, apply 2 quarts (for symphylans) or 1 gallon (for symphylans and wireworms) DYFONATE 4-E per acre, broadcast, prior to planting and incorporate into the soil by discing.

TABLE BEETS: For control of cabbage maggot and garden symphylans apply 2 quarts DYFONATE 4-E per acre, broadcast, prior to planting. Incorporate into the soil by discing.

TOBACCO: For control of wireworms, apply 1 to 2 quarts DYFONATE 4-E per acre, broadcast, prior to bedding and transplanting and incorporate into the soil by discing.

II-9
Storage Instructions:

Pesticides should be secured from unauthorized persons, especially children, and should be stored in a clean condition, free from spills, to avoid cross-contamination or a buildup of toxic fumes.

OBSERVE THE FOLLOWING USE PRECAUTIONS

- Read all directions before using.
- Do not apply to any crop, or in any manner not specified on this label.
- Not for use or storage in or around the home.
- Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals or onto adjoining food, fiber or pasture crops. Do not contaminate food or feed.
- This product will kill fish and wildlife. Keep out of lakes, ponds and streams. Do not contaminate water by cleaning of equipment or disposal of wastes. Birds feeding on treated areas may be killed.

UNIT III
CALIBRATION

III-1
Why Calibrate?

Even if you have the right mixture in your spray tank, you can still apply the wrong amount of pesticide. You need to know at what rate your equipment is applying the pesticide to the target areas.

III-2
Calibration of Sprayers

1. Clean equipment. It is essential that all nozzles, screens, strainers, pumps, and hoses be clean before calibrating sprayer delivery. Worn or rusted parts should be replaced.

2. Measure the length of the boom in feet. Let's assume the boom is 16 feet long.

3. Calculate distance to travel to spray one acre by dividing the length of the boom into 43,560 (square feet in an acre). The result will tell you how many feet to travel to cover one acre. With a 16-foot boom, it will be necessary to travel 2722 feet to spray one acre.

4. Measure a given distance for the test run. In this case, measure one-fifth of 2722 feet, or 544 feet.

5. Fill tank with water, set the sprayer as you would while spraying in the field. Travel at a speed that would normally be used. Spray water over the measured distance just as it would be sprayed over the field. In this case, 544 feet.

6. Measure the number of gallons of water required to fill the tank. If it requires 2 gallons of water for the 544-foot course (one-fifth of an acre), multiply by five to find out how much is required to spray one acre (10 gallons). For every 10 gallons of water the tank holds, add the number of pounds, pints, or quarts of insecticide recommended per acre.

III-3
Changing Delivery Rate

If your sprayer is delivering less or more spray to each acre than you want it to, you can change the rate by three methods:

1. You can change the pump pressure. Lower pressure means less spray delivered; higher pressure means more spray delivered. This is not usually a good method because a pressure change will change the nozzle pattern.

2. You can change the speed of your sprayer. Slower speed means more spray delivered; faster speed means less spray delivered. This may be practical for small changes in number of gallons, but not for large delivery changes.

3. You can change the discs or jets in the nozzles to change the amount each nozzle delivers. The larger the hole in the disc, the more spray delivered. This is usually the preferred method.

III-4
Calibrating Granular Applicators

The easiest and most accurate method of calibrating granular applicators is by collecting the granules from each delivery tube while the equipment is being driven at field speed. Granules should be weighed from each row to determine the amount applied on 1000 feet. The simple steps for calibrating are:

1. Set rate control adjustment on applicator according to the manufacturer's instructions for the granules that are used.

2. Add granules to hopper.

3. Attach paper or plastic bags to each delivery tube for each row.

4. Travel 1000 feet.

5. Remove bags and weigh each separately.

6. Readjust equipment until each tube is delivering the correct amount per 1000 feet of row.

III-4.1 The amounts of granules usually recommended per 1,000 feet of row (one pound active ingredient per 13,000 feet of row) are:

Percent granules	Ounces per 1000 feet
10%	12
15%	8
14%	8.5
20%	6

Inexpensive postage scales or diet scales are a good way to weigh granules. Such scales are good investments, because improper calibration can result in higher costs, poor protection, crop injury, or illegal applications.

UNIT IV
ENVIRONMENTAL CONSIDERATIONS

IV-1
Pesticides in the Environment

For years pesticides have been used to control pests which could be harmful to man. Rats carrying plague or mosquitoes carrying malaria are good examples. Control programs are necessary today, especially in crowded cities and countries with large populations. However, pesticides can be harmful, too. Any pesticide which is off-target is a pollutant and can be dangerous. Misuse or carelessness can cancel all of the benefits of any pesticide.

IV-1.1 Food: With the help of pesticides, diseases, insects, and other plant pests can be greatly reduced. Less land must be tilled to produce higher yields and better crop quality. Good farm land may become unfit for crops, though, if overdoses of pesticides are applied. The crop may absorb the pesticides from the soil and be over the set tolerance at harvest. Or the pesticide may kill all or most plant life and make the land useless for farm use.

IV-1.2 Livestock: Pesticides can also protect livestock from the constant irritation of harmful and annoying pests. The quantity and quality of livestock products--milk, meat, etc.--are improved when the pests are controlled. Pesticide drift onto forage and pasture land or into drinking water can poison livestock. Once taken into the animals' systems, these pesticides can also lead to illegal residues in the meat and byproducts of the animals. They may be unfit for human consumption.

IV-2
Wildlife

Pesticides can be harmless to wildlife when used carefully and on target. They may even aid wildlife by controlling runaway pests which could harm them. Pesticides can also be poisonous to wildlife. The toxicity of every chemical to every animal is not known. A pesticide that is only slightly toxic to one living thing may be very toxic to another. A pesticide that is relatively harmless to birds may be highly poisonous to fish or mammals.

IV-2.1 Food Chain: Wildlife are also important because of their place in the food chain. Food chain is a way of describing how all animals depend on each other. Each animal has a place in the chain depending on the type of food it eats. Animals which eat only plant materials are at the bottom of the chain. Animals which eat these plant-eaters are on the next level. The animals which eat meat are at the top of the chain. In this complex food chain, each animal has an important place. The loss of any animal disrupts the whole chain.

IV-2.2 Accumulative Pesticides: Some pesticides can build up in the bodies of animals, including man. These are called accumulative pesticides. The chemicals can build up in an animal's body until they become harmful to it. These pesticides can also accumulate in the food chain. Meat-eaters feeding on other animals with built-up pesticides may receive high doses of pesticides. If they feed on too many of these animals, the meat-eaters can be poisoned without ever directly contacting the pesticide. The build up through the food chain can injure animals which aid man.

IV-2.3 Non-accumulative Pesticides: Many pesticides do not build up in the bodies of animals or in the food chain. These are non-accumulative pesticides. These chemicals usually break down reapidly into other, relatively harmless materials. Organophosphate pesticides, for example, may have high toxicity at first and may cause local kills, but they do not accumulate, so they are not as dangerous to the environment. Usually pesticides which break down quickly in the environment are least harmful to it.

IV-2.4 Persistent Pesticides: Persistent pesticides stay in the environment for long periods of time. Persistent pesticides do not necessarily accumulate in animals' bodies or in the food chain. Some pesticides (for example, atrazine) persist in the soil but do not seem to build up in animals. Thus, they give long term control, but do not slowly poison wildlife. Persistent pesticides can be fairly harmless to the environment.

IV-3
Plants

Pesticides are often used on plants to portect them or maintain their beauty. However, pesticides can injure plants; such injury is called phytotoxicty and ranges from slight burning or browning of the leaves to death of the entire plant.

IV-3.1 Movement: Pesticides which drift off target during application are a great threat to desirable plants and trees. Care must be used to avoid such drift.

But pesticides can move in other ways, too. Some are carried off target by rain and runoff water and injure plants in the water's path. Other pesticides may move through the soil to surrounding areas and cause injury in this way. Certain formulations of pesticides vaporize easily and this vapor can drift a long way. This vapor can settle on desirable plants and trees, causing severe damage. If plant injury could be a problem, try to choose a pesticide and formulation which tend to remain on the target area.

IV-4
Weather-Wise Application

Weather-wise application can reduce pesticide hazard to the environment. A good applicator carefully checks the weather conditions before beginning spray operations. Not only do a few simple precautions protect the environment, but they save the applicator time and money, since pesticides which do not reach the target areas are wasted.

IV-4.1 Avoid Windy Days: High winds increase drift and result in loss of pesticides on treated areas. Drifting pesticides increase the possibility of injury to wildlife, pollinators, and domestic animals. They may settle on forage, pasture, or wildlife areas, or contaminate water. Pesticide application on quiet days reduces the hazards of inhalation and contact to the applicator and the bystander. Drift onto sensitive crops can also be avoided in this way. The applicator is highly responsible for any injury or money loss on crops due to pesticide drift. Don't take a chance by spraying in the wind.

IV-4.2 Avoid Heavy Rains: Spray applications should not be made just before a heavy rain, because the pesticide washes off, thus not controlling the pest. (Note: some protectant fungicide sprays are put on the leaves before and during a rain.) Heavy rains cause runoff and tend to wash the pesticide away from the target areas. The runoff can carry the pesticide onto sensitive crops and also often reaches farm ponds, streams, and waterways.

IV-4.3 Early Morning or Evening Application: Wind speed is usually lowest at these times of the day and drift hazard is greatly reduced. Children and domestic animals are less likely to be in sprayed areas during these hours. Avoiding full daylight hours lowers the contact danger to wildlife who often visit crop lands only during the day.

IV-5
Safe Disposal Practices

As an applicator, you have two disposal problems. First, you must safely dispose of surplus pesticides that you have no use for. Second, you must safely dispose of empty pesticide containers. Careless disposal practices are a common cause of pesticide misuse and environmental contamination.

IV-5.1 Surplus Pesticides: Pesticides which are still in the original, unopened container may be returned to the manufacturer.

IV-5.2 If you mix too much pesticide for a job, try to find other areas with the same problem and use any extra tank mix or rinse water on these. Otherwise, apply small amounts of extra tank mix over an area where you are certain it can't do any harm. Add Clorox or lime to the surplus tank mix before spraying to aid in breaking the chemical down quickly.

If the manufacturer won't take back your extra concentrates and/or you cannot use up your pesticides, you must find other safe ways to dispose of them.

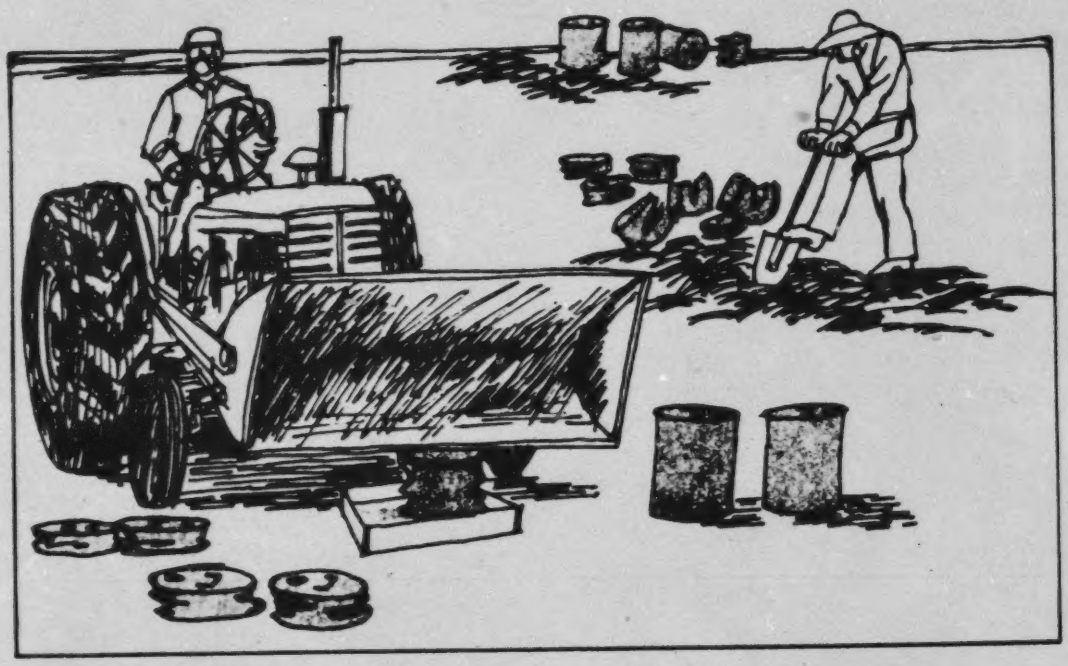
Store your extra pesticides in your regular locked storage area while you are waiting to dispose of them legally. Keep them in their original containers with the labels if possible. Otherwise, 55-gallon drums with clamp covers make good storage containers for smaller empty containers or other surplus pesticides.

IV-5.3 Empty Pesticide Containers: Empty pesticide containers are not really "empty," since they still contain small amounts of pesticide even after they have been rinsed out properly. Never toss them in streams, ponds, fields, or empty buildings! Be able to account for every container you used for the job.

IV-5.4 Dispose of all pesticide containers carefully and properly. You should separate the empty containers for disposal into three main types: (1) those that will burn; (2) those that will not burn; and (3) those that contained mercury, lead, cadmium, arsenic or inorganic pesticides. All empty containers, regardless of their type, should be rinsed three times before disposal. Treat the rinse water as a surplus pesticide and dispose of it properly. Never dump rinse water on the ground!

IV-5.5 Burnable containers are usually wood, cardboard, or paper. Small quantities of these may be burned if local laws allow burning. Never burn containers that hold 2,4-D type weed killers. The smoke from such a fire could cause serious damage to nearby plants and trees.

IV-5.6 Non-burnable containers are usually glass, metal or plastic. Containers which cannot be returned to the manufacturer can be crushed, borken, or cut apart and buried 24 inches deep in an isolated location away from water supplies.



IV-5.7 Do not burn empty containers which held mercury, lead, cadmium, arsenic or inorganic materials. They may be crushed and stored in a 55-gallon drum (separate from any containing regular non-burnable pesticide containers) until state and federal regulations are checked for proper disposal.

UNIT V
BASIC SAFETY

Safety Precautions

V-1 Plan Ahead: Be sure that plenty of soap and/ or detergent and water are nearby for emergencies or cleanup. Check the label and wear all the protective gear necessary. Choose a time when weather conditions are right. Choose the safest effective pesticide available. Always be sure that the intended use is on the label.

V-2
During Application

V-2.1 Avoid Exposure: Do not work in drift, spray or runoff unless properly protected. Do not wipe your hands on your clothing if chemicals have been spilled on your gloves; they may soak through to your skin.

V-2.2 Do not blow out clogged hoses, nozzles, or lines with your mouth. Never eat, drink, or smoke when handling pesticides; wash your face and hands thoroughly first.

V-2.3 When working with pestcides day after day, even moderately toxic chemicals can poison you. Consider using protective equipment, especially a respirator, even if the label doesn't call for it.

V-2.4 Watch out for others, too. Supervise your employees and be sure that they follow all safety precautions. Always work in pairs when handling hazardous pesticides. If you feel sick, don't try to "finish up" the job. Get out of the area and get help fast!

V-2.5 Keep children, unauthorized persons, and pets out of the areas to be sprayed. Do not let children or pets play around sprayers, dusters, filler tanks, storage areas, or old pesticide containers.

V-2.6 Use the proper rates. Overdoses won't kill pests twice, but may injure humans, crops, or wildlife and are misuses.

V-3 Avoid Sensitive Areas: Avoid spraying near apiaries, lakes, streams, pastures, houses, schools, playgrounds, or sensitive crops whenever possible. If you must spray, avoid windy days and always spray downwind from the sensitive area. Consider spraying near living quarters in the early morning or evening when people and pets are least likely to be exposed. Never spray directly into or across streams, ponds, or lakes.

V-4 Avoid Spills, Runoff, and Drift: Pesticides which fall anywhere but on the target area can injure crops, people, and the environment. Avoid applying chemicals when drift or runoff is likely to occur. High winds and heavy rains favor drift and runoff. Choose application equipment and formulations that will minimize drift and runoff hazard. Spills can be avoided by using care and caution.

V-5 Avoid Equipment Accidents: Poor maintenance and careless use of equipment can add to hazards. Check your equipment thoroughly before you begin. Be sure it is working correctly and calibrated properly. Use the correct nozzles, pressure, and droplet size to avoid drift.

V-5.1 Be sure there are no leaks in the tank. Check for leaky connections and worn spots in hoses that could burst and splash you or others with poisonous sprays. The spray tank should have a tight lid so that splashing cannot occur and spray materials will not leak onto the ground.

V-5.2 When the tank is being filled, you should stay with it; a tank that is not watched often runs over and causes pesticide spill on the ground, into a stream, or back-siphoning into a well.

V-5.3 Machinery should be shut down if you find it necessary to adjust or repair any moving parts. If nozzles, hoses, or lines clog, do not blow them out with your mouth. Even dilute spray mixtures can be toxic.

V-6
Symptoms of Pesticide Poisoning

V-6.1 General Symptoms: Unfortunately all pesticide poisoning symptoms are not the same. Each chemical family attacks the body in a different way. However, the general symptoms are:

V-6.2 1. Mild poisoning or early symptoms of acute poisoning--headache, fatigue, weakness, dizziness, restlessness, nervousness, perspiration, nausea, diarrhea, loss of appetite, loss of weight, thirst, moodiness, soreness in joints, skin irritation, eye irritation, irritation of nose and throat.

V-6.3 2. Moderate poisoning or early symptoms of acute poisoning--nausea, diarrhea, excessive saliva, stomach cramps, excessive perspiration, trembling, no muscle coordination, muscle twitches, extreme weakness, mental confusion, blurred vision, difficulty in breathing, cough, rapid pulse, flushed or yellow skin, weeping.

V-6.4 3. Severe or acute poisoning-- fever, intense thirst, increased rate of breathing, vomiting, uncontrollable muscle twitches, pinpoint pupils, convulsions, inability to breathe, unconsciousness.

If you are in doubt whether poisoning has occurred, let a doctor decide!

V-7
First Aid for Pesticide Poisoning

V-7.1 Poison on the Skin: Drench skin and clothing with water (shower, faucet, hose, or pond). Remove clothing. Cleanse skin and hair thoroughly with soap or detergent and water. Dry and wrap in a blanket. WARNING: Do not allow any pesticide to get on you while you are helping the victim!

V-7.2 Poison in the Eye: It is most important to wash the eye out as quickly as possible, but be gentle. Hold eyelids open, wash eyes with a gentle stream of clean running water. Continue washing for 15 minutes or more. Do not use chemicals or drugs in wash water. They may increase the extent of the injury.

V-7.3 Inhaled Poisons: If victim is in enclosed space, do not go in after him without an air-supplied respirator. Carry patient (do not let him walk!) to fresh air immediately. Open all doors and windows. Loosen all tight clothing. Apply artificial respiration if breathing has stopped or is irregular.

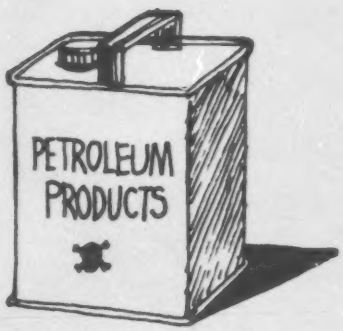
Keep patient as quiet as possible. If he is convulsing, watch his breathing and keep him from falling and striking his head. Keep his chin up so his air passage will remain free for breathing. Prevent chilling by wrapping in blankets, but do not overheat. Do not give alcohol in any form!

V-7.4 Swallowed Poison: The most important decision you must make when aiding a person who has swallowed a pesticide is to make him vomit or not. Usually it is best to get rid of the swallowed poison fast, but:

1. Never induce vomiting if the victim is unconscious or in convulsions. The victim could choke to death on his vomitus.

2. Never induce vomiting if the victim has swallowed a corrosive poison. A corrosive poison is a strong acid or alkali. The victim will complain of severe pain and have signs of severe mouth and throat burns. A corrosive poison will burn the throat and mouth as severely coming up as it did going down.

3. Never induce vomiting if the person has swallowed petroleum products, that is, kerosene, gasoline, oil, lighter fluid. Most pesticides which come in liquid formulations are dissolved in petroleum products.



V-7.5 Exceptions:

If concentrates of highly toxic pesticides are swallowed, induce vomiting immediately. The risk of absorbing in the stomach is much greater than the risk of petroleum in the lungs.

If the victim has swallowed a dilute form of any formulation, he should be forced to vomit immediately.

V-8
How To Induce Vomiting

Do not waste a lot of time trying to induce vomiting. Use it only as a first aid until you can get the victim to a hospital. Make sure the victim is lying face down or kneeling forward while retching or vomiting. Do not let him lie on his back because vomitus could enter the lungs and do more damage.

V-8.1 1. First give the victim large amounts of milk or water. One to two cups for victims up to five years old; up to a quart for victims five years and older.

V-8.2 2. Induce vomiting by putting your finger or the blunt end of a spoon at the back of his throat. Do not use anything sharp or pointed! A glass of soapy water or strong salt water will also cause the victim to vomit.

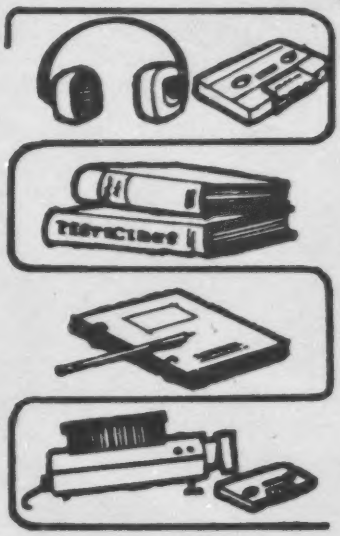
V-8.3 3. Collect some of the vomitus for the doctor; he may need it for chemical tests.

V-9
Universal Sponge

Use this only after other first aid suggestions for poisoning are followed.

Activated Charcoal: Mix with water into a thick soup for the victim to drink. Activated charcoal is found in aquarium filters and is also available from a drug store.

Pesticides Applicator TRAINING PROJECT...



Printed Programmed Instruction

1975

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE
J. L. ADAMS, DIRECTOR

PROGRAMED INSTRUCTION UNITS
PESTICIDES APPLICATOR TRAINING PROJECT

UNIT I

INSECTS DESTRUCTIVE TO CORN AND SORGHUM

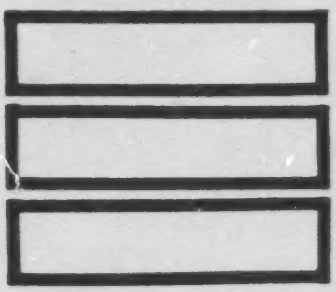
Program Designed and Developed
by
James Buterbaugh, Ph.D.
University of Nebraska--Lincoln

DIRECTIONS: Using the special yellow marker, answer the following questions by lightly shading the boxed area which corresponds with your answer. If your choice is the best one, the box will look like this:

Shade area in box with special marker.

If your choice isn't the best one, the box will direct you to read specific information printed in the attached "PINK" section, and then try again.

1. Corn Rootworm Larvae are:

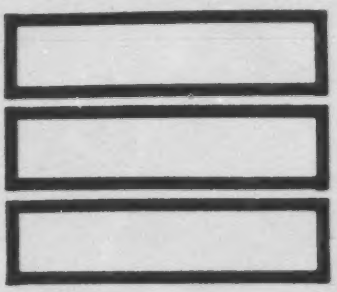


a.) white with a dark head and dark spot on the top of their tail

b.) grayish to black in color

c.) yellow, orange, or brown in color

2. Corn Rootworm Larvae cause plant damage as:



a.) they chew on the corn stalk just above ground level

b.) they tunnel inside corn roots, chewing the small roots from the stalk

c.) they infest the seed corn, germination then will not occur

3. Normally, the Corn Rootworm egg hatching begins:

a.) in late May or early June

b.) right after the eggs are deposited from the last of August through the first half of September

c.) during midwinter months

4. The most effective prevention for Corn Rootworm is:

a.) to burn infested corn stalks

b.) to plant corn the first week of June

c.) to rotate crops

5. Chemically, Corn Rootworm post-emergent measures include:

a.) Bux 10G, Dasanit 15G, Dyfonate 10G, Dyfonate 20G, Diazinan 14G, Di-Syston 15G, Furadan 10G, Thimet 15G, and MOCAP 10G

b.) Aldrin or Heptachlor

c.) Toxaphene EC, Parathion EC, Sevin 80WP, Malathion EC and Chlordane EC

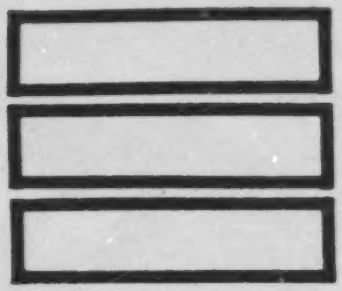
6. Which one of the following areas do Black Cutworms <u>not</u> feed?

a.) at or below the soil line

b.) in the corn ear silks

c.) generally below the surface near the moist soil

7. The Sandhill Cutworm differs from the Black Cutworm in the following manner:

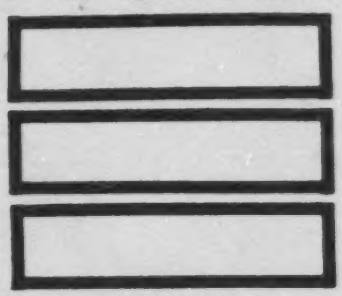


a.) in color, the Sandhill Cutworms are light colored

b.) they damage the plants during the daylight hours in addition to evening hours

c.) no difference except that they habitate in sandy soils

8. Most Cutworms overwinter:

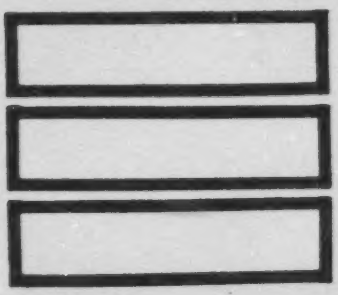


a.) in the egg stages in the soil

b.) as fully grown worms or pupae in the soil

c.) as moths and migrate to the southern states to survive winter temperatures

9. The Cutworm produces moths at the following rate:

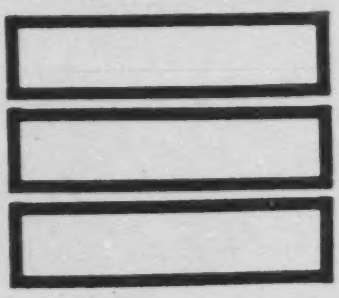


a.) at least ten broods at two-week intervals

b.) probably two generations every year--in the early spring and late fall

c.) only once at the highest period of summer

10. The chemical _____ bait is effective when the Cutworms are ½ inch long or less and the soil is moist to surface.



a.) Heptachlor (1 pound per acre)

b.) Chlordane (4 pounds per acre)

c.) Sevin 5%

11. All of the following insects attack plants below ground level <u>except</u>:

a.) Corn Rootworm Larvae

b.) Corn Rootworm Adults

c.) Black Cutworms

12. Corn Rootworm Adults vary in color identification. Southern Corn Rootworms are yellow to greenish with six black spots on each side of the wing cover. They are known as spotted:

a.) Cucumber Beetles

b.) Sap Beetles

c.) Chartreuse Weevils

13. Among late planted corn plants, Corn Rootworm Adults feed extensively on:

a.) the bases of the stalk's leaves

b.) the inside of the corn roots like the Corn Rootworm Larvae

c.) silks at the time pollen is being produced

14. Western and Northern Corn Rootworm Adults in Southern Nebraska emerge about _____ from the pupae.

a.) the first of July

b.) early spring

c.) mid September

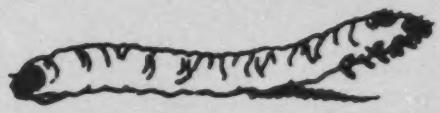
15. Chemical control of Corn Rootworm Adult should be applied when severe silk chewing is occuring at:

a.) 70 to 85 percent pollen shed

b.) 5 to 15 percent pollen shed

c.) 25 to 50 percent pollen shed

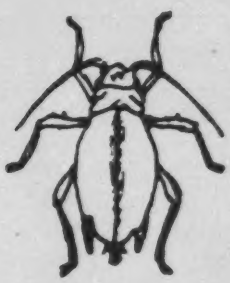
16. Identify the European Corn Borer:

a.) 

(white with black spots and about ½ inch long)

b.)

(light grey with small dark spots)

c.) 

(light green or greenish-yellow with a darker green stripe)

17. The Adult European Corn Borers are buff-colored moths that deposit masses of white eggs about the size of:

a.) a pin head

b.) the radious of an ear of corn

c.) your small fingernail

18. First brood European Corn Borers reduce yields but the second brood borers cause most damage:

a.) in broken stalks and fallen ears at harvest time

b.) to separate kernnels of grains

c.) tassel pollen count

19. European Corn Borers spend the winter in:

a.) southern states with adults migrating north in the spring

b.) moist soil that doesn't freeze

c.) infested corn stalks and stalks of many other plants

20. Apply chemical controls when first brood of European Corn Borers are present in:

a.) the plant's ear shanks

b.) 50 percent of corn plants that are at least 24 inches in extended leaf height

c.) 10 percent of corn plants at any height

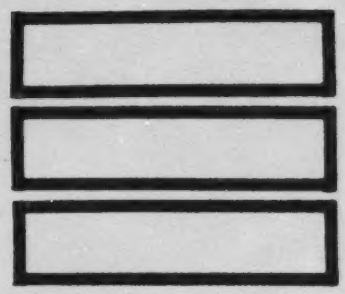
21. The Greenbug (illustrated in question 16, response C.) develops:

a.) on the tassel areas of corn plants

b.) on the tips of corn

c.) on the undersides of sorghum leaves

22. Greenbugs, drifted by the wind from southern states, bear young that mature and in turn begin reproduction _____ days after birth.

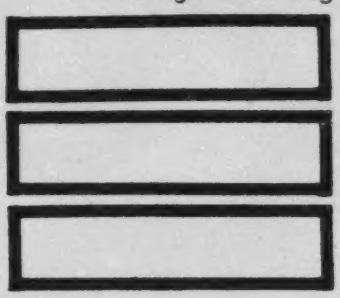


a.) 7

b.) 21

c.) 45

23. The average Greenbug reproduces:

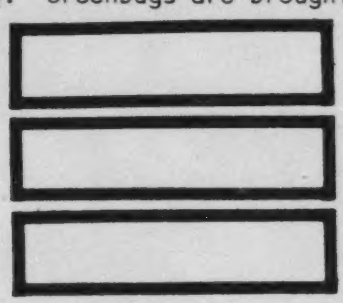


a.) about 100 young then dies

b.) 2 or 3 young a day for a period of fourteen days (30 to 50)

c.) less then 5 young

24. Greenbugs are brought under control by all the following elements except:

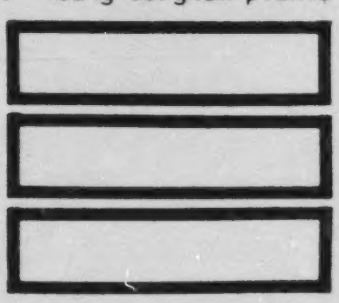


a.) the Lysa Wasp infests the Greenbug by laying eggs in the bodies and killing it

b.) Greenbugs disappear after Sorghum matures or because of the lack of food plants

c.) the lack of rain in July

25. Young Sorghum plants should be treated chemically when Greenbug:



a.) parasite count is 65 percent

b.) cause a visible yellowing when they are located on the lower leaves

c.) begin migration from the southern state

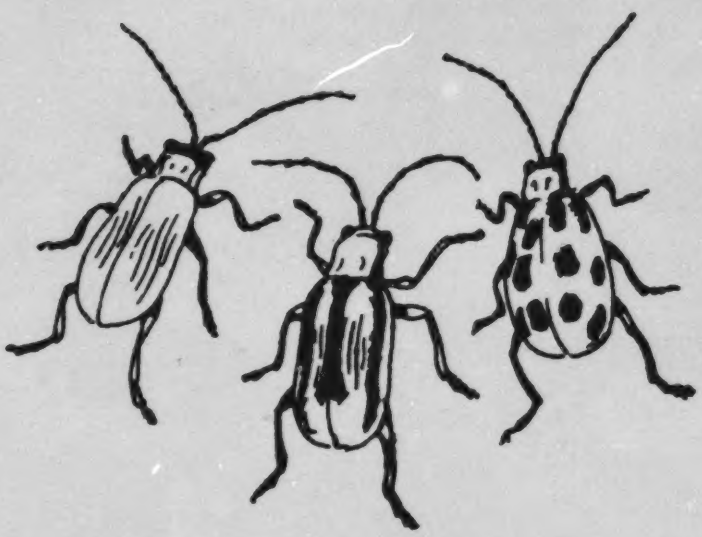
26. When chemically controlling Greenbugs, granules appear to be _____ as sprays.

a.) less effective

b.) more effective

c.) equally effective

27. Identify the following black and yellow insects.



a.) Corn Sap Beetles

b.) European Corn Borers

c.) Corn Rootworm Adults

PROGRAMED INSTRUCTION UNITS
PESTICIDES APPLICATOR TRAINING PROJECT

UNIT 11

LABEL READING

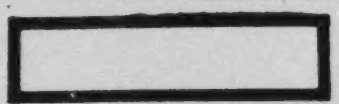
Program Designed and Developed
by
James Buterbaugh, Ph.D.
University of Nebraska--Lincoln

DIRECTIONS: Using the special yellow marker, answer the following questions by lightly shading the boxed area which corresponds with your answer. If your choice is the best one, the box will look like this:

Shade area in box with special marker.

If your choice isn't the best one, the box will direct you to read specific information printed in the attached "YELLOW" section, and then try again.

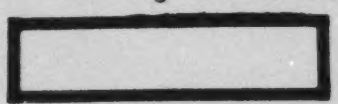
1. Pesticide labels identify container contents in two sections; they are:


a.) natural ingredients and synthetic ingredients

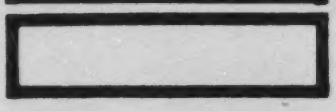
b.) active ingredients and inert ingredients

c.) emulsifiers and solvents

2. These ingredients are listed with percentages which must total:


a.) 20%

b.) 65%


c.) 100%

3. Inert ingredients contain emulsifiers and other compounds which have _____ _____ proven insecticidal effectiveness.

a.) little or no

b.) great

c.) laboratory

4. On the pesticide label, the active ingredients can be indicated by:

a.) the order in which they appear

b.) the chemical name and percentage

c.) symbols

5. "Toxicity" means:

a.) poisonous extent of a pesticide

b.) quantity of pesticide administered

c.) FIFRA Approved (Federal Insecticide, Fungicide, and Rodenticide Act)

6. "Highly Toxic" category of acute toxicity is labeled:

a.) "DANGER"

b.) "CAUTION"

c.) "WARNING"

7. The most poisonous chemicals are designated:

a.) "Relatively Non-toxic" (Category IV)

b.) "Moderately Toxic" (Category II)

c.) "Highly Toxic" (Category I)

8. If a person who swallows poison is unconscious,:

a.) apply cold running water on his body

b.) he should be walked

c.) never put anything in his mouth

9. "Highly Toxic" pesticides MUST have the following on the label:

a.) "POISON" printed in red

b.) the statement "KEEP OUT OF THE REACH OF CHILDREN"

c.) both above items plus an antidote statement, first-aid instructions, and a statement to immediately call a physician

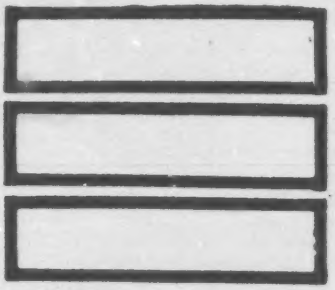
10. "Moderately Toxic" pesticides must carry the following signal items except for:

a.) the word "WARNING"

b.) the sentence "KEEP OUT OF THE REACH OF CHILDREN"

c.)

11. "Slightly Toxic" is _____ as toxic as "Moderately Toxic" category.

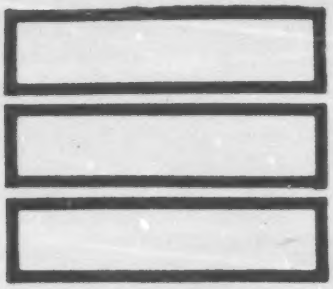


a.) half

b.) one-tenth

c.) 80%

12. Pesticides which may be irritating to the skin, nose, throat and eyes but do not necessarily carry a warning label are classified:

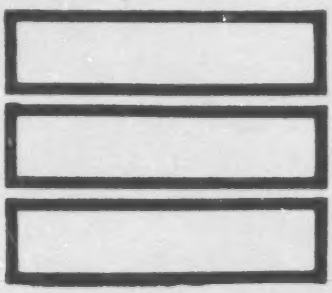


a.) "Moderately Toxic"

b.) "Slightly Toxic"

c.) "Relatively Non-toxic"

13. Methomyl insecticide is classified:

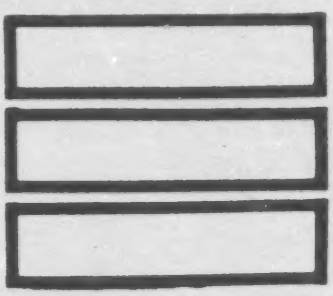


a.) "Relatively Non-toxic"

b.) "Moderately Toxic"

c.) "Highly Toxic"

14. Methoxylcholor insecticide is classified:

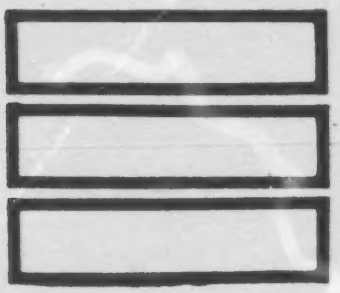


a.) "Relatively Non-toxic"

b.) "Moderately Toxic"

c.) "Highly Toxic"

15. Emergency first aid instructions which are printed on a pesticide label are provided primarily for:

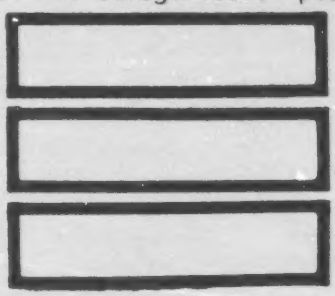


a.) a physician

b.) a layman

c.) a medical technician

16. All categories of pesticide labels universally contain on the front panel:

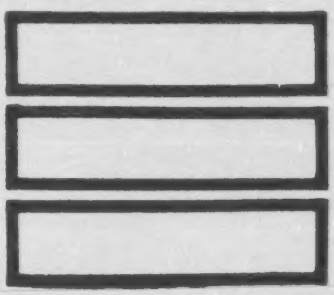


a.) words "DANGER/POISON"

b.) the statement "KEEP OUT OF REACH OF CHILDREN"

c.) FIFRA Approved (Federal Insecticide, Fungicide, and Rodenticide Act)

17. The most logical concentrated pesticide storage would be:

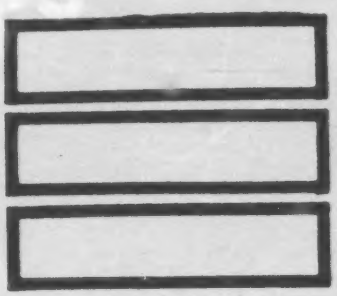


a.) in the family medicine cabinet

b.) on a high barn shelf

c.) in a highly secure cross-ventilated area

18. If pesticides are spilled in a storage area,:



a.) contamination of other products or a build-up of toxic fumes could exist

b.) no danger will prevail

c.) ask a member of your family to clean the area

19. Directions for the use of a pesticide product tell:

a.) where to apply and how to mix

b.) how much to use for specific pests with certain forms of application

c.) all of the above

20. Directions on a pesticide label must be adequate to protect the public by relating specific information:

a.) to meet FDA standards

b.) to avoid contamination of living conditions

c.) to avoid costly chemical waste

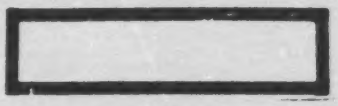
PROGRAMED INSTRUCTION UNITS
PESTICIDES APPLICATOR TRAINING PROJECT

UNIT III

CALIBRATION

Program Designed and Developed
by
James Buterbaugh, Ph.D.
University of Nebraska--Lincoln

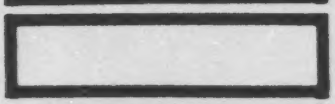
DIRECTIONS: Using the special yellow marker, answer the following questions by lightly shading the boxed area which corresponds with your answer. If your choice is the best one, the box will look like this:

Shade area in box with special marker. 

If your choice isn't the best one, the box will direct you to read specific information printed in the attached "GREEN" section, and then try again.

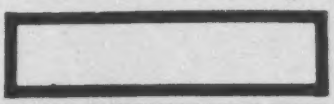
1. After determination of chemical mixtures, _____ is figured to know what rate the spray equipment is applying the pesticide.

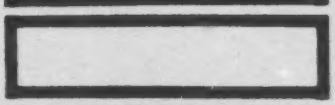
a.) caliphatation

 b.) calibration

c.) calefaction

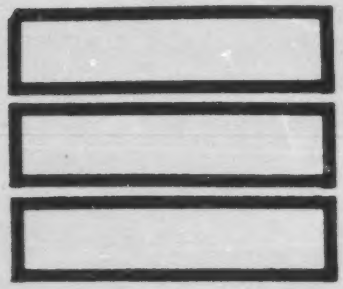
2. Before calibrating sprayer delivery, all the application equipment must be:

 a.) adjusted

 b.) cleaned

c.) replaced

3. In calculating the traveling distance to spray one acre (43,560 square feet), mathematically:

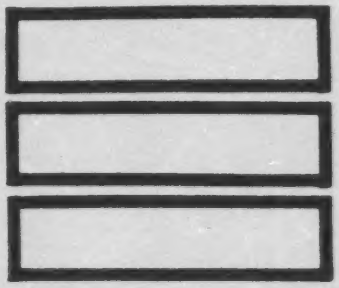


a.) <u>divide</u> the length of the boom into 43,560

b.) <u>multiply</u> the length of the boom into 43,560

c.) compute 43,560 into gallons applied

4. One acre (43,560) square feet <u>divided by</u> 16 feet (length of boom) will require pesticide applicators to travel:

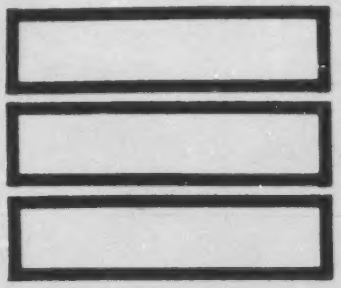


a.) 6844 feet to spray one acre

b.) 2722 feet to spray one acre

c.) 2122 feet to spray one acre

5. When the number of feet to spray one acre is determined, measure <u>one-fifth</u> of the amount of the correct figure in question 4. This amount is:

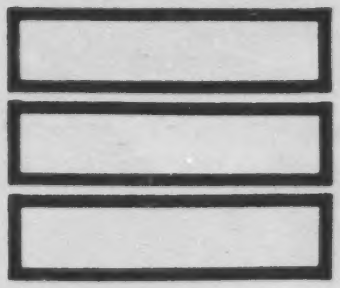


a.) 544 feet

b.) 844 feet

c.) 144 feet

6. When this footage is figured, measure the number of gallons of water required to cover this distance. This amount would then be multiplied by _____ to find how many gallons are required to spray one acre.



a.) 10

b.) 5

c.) 43

7. If the spray equipment is delivering less or more spray than required, the spray rate can be changed by (how many) methods?

a.) two

b.) three

c.) five

8. The best method of changing the spray rate is:

a.) to change pump pressure

b.) to change the sprayer speed

c.) to change the sprayer discs or jets

9. If the sprayer pump pressure is changed, a low pressure will deliver:

a.) less spray

b.) more spray

c.) the same rate regardless of the amount of pressure

10. When the pump pressure is changed, the:

a.) spraying time will not be affected

b.) nozzle pattern will be varied

c.) spray application will not be affected

11. Traveling speed changes of the sprayer are practical for:

a.) no changes in spray delivery

b.) large delivery changes

c.) small changes in gallon application

12. A slower traveling speed results in:

a.) more spray delivery

b.) less spray delivery

c.) no change of spray delivery as compared with faster speeds

13. The larger size spray disc holes will apply _____ pesticide.

a.) less

b.) about the same

c.) more

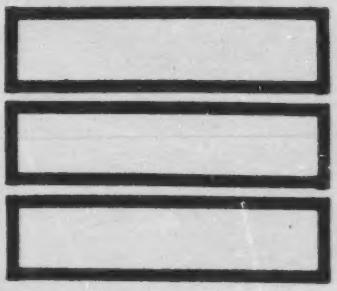
14. When calibrating granular applicators, the most accurate method is determined by:

a.) checking each application box after completion of every field round

b.) collecting and weighing granules from each delivery tube

c.) double check control adjustment with manufacturer's instructions

15. A logical distance to travel when collecting and weighing granules from each delivery tube is:

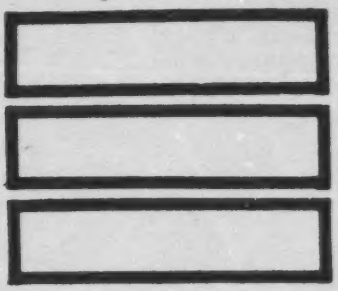


a.) 100 feet

b.) 1000 feet

c.) 43,560 square feet (an acre)

16. All granular rate control adjustments should be initially set:

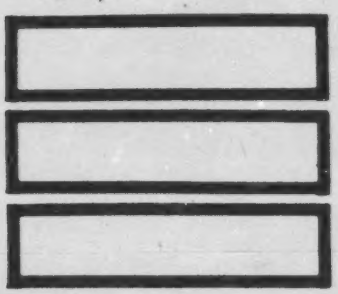


a.) at different settings for application variation

b.) according to manufacturer's directions

c.) by manufacturer and not changed

17. For weighing the easiest method of recovering granules that have been delivered is by:

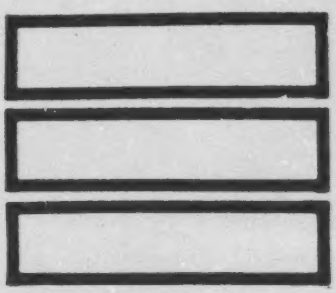


a.) estimating the amount used from each application box

b.) picking up granules that have been dropped in each row

c.) attaching paper or plastic bags to each tube

18. After bags are removed from the delivery tubes:



a.) all bags should be weighed together

b.) each bag should be weighed separately

c.) contents should be weighed separately from the bag

19. The amounts of granules usually recommended per 1000 feet are:

a.) one-half pound active ingredient per 13,000 feet of row

b.) one pound active ingredient per 13,000 feet of row

c.) one pound per 43,560 square feet (one acre)

20. With the formula one pound of active ingredient per 13,000 feet of row, 10% granules equal _____ ounces per 1000 feet.

a.) 6

b.) 8

c.) 12

21. For weighing granules, a _____.

a.) milliliter scale is recommended

b.) postage scale (inexpensive) is recommended

c.) Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) approved scale is required

22. Proper calibration is advised because of:

a.) crop injury, poor protection and illegal application

b.) resulting waste and higher costs

c.) all the above

PROGRAMED INSTRUCTION UNITS
PESTICIDES APPLICATOR TRAINING PROJECT

UNIT IV

ENVIRONMENTAL CONSIDERATIONS

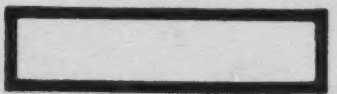
Program Designed and Developed
by
James Buterbaugh, Ph.D.
University of Nebraska--Lincoln

DIRECTIONS: Using the special yellow marker, answer the following questions by lightly shading the boxed area which corresponds with your answer. If your choice is the best one, the box will look like this:

Shade area in box with special marker.

If your choice isn't the best one, the box will direct you to read specific information printed in the attached "BLUE" section, and then try again.

1. Effective use of pesticides will create:



a.) more food on less acres

b.) free more land for wildlife and recreational purposes

c.) all factors above

2. Pesticides can affect animal products:

a.) by improving the quantity and quality of the livestock

b.) by always contaminating livestock productions

c.) by having no affect whatsoever

3. Pesticide chemicals affect wildlife (birds-fish-mammals):

a.) all the same way

b.) all highly toxic

c.) varied, each differently

4. The "Food Chain" classifies how animals depend on each other. Which statement below is true?

a.) Animals which eat plant-eaters are at the bottom of the "Food Chain."

b.) Animals which eat meat are at the bottom of the "Food Chain."

c.) Animals which eat plant-eaters are between the bottom and top of the "Food Chain."

5. "Accumulative pesticides":

a.) build up in animals, including man

b.) are carried over from one year to the next

c.) are least harmful to the environment.

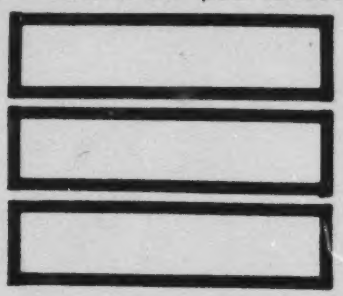
6. Organophosphate pesticides are:

a.) highly accumulative in nature

b.) highly toxic at first but do not accumulate

c.) are greatly harmful to the environment

7. Persistent pesticides which include Atrazine:

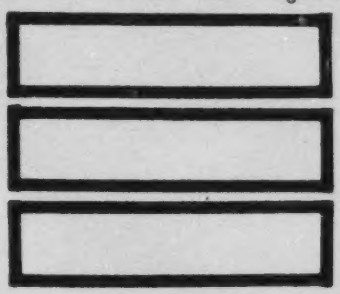


a.) stay in the environment for long periods of time

b.) do not seem to build up in animals

c.) both of the above in addition to providing long term control

8. Pesticides can injure plants; such injury is called:

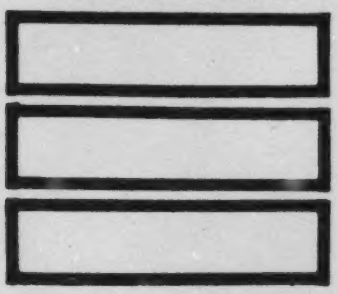


a.) "Pytophagous"

b.) "Phytotoxicty"

c.) "Phytosterol"

9. Pesticides move off target by what methods?

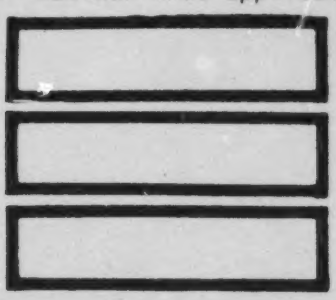


a.) wind and vapor

b.) rain and soil movement

c.) all of the above

10. Weather-Wise applications are best described as:



a.) using simple precautions to protect the environment

b.) saving both time and money because of drift waste

c.) all of the above

11. When wind causes pesticides to drift and to injure others' property,:

a.) the applicator is highly responsible

b.) loses are attributed to nature with no personal liability

c.) use less toxic chemical mixtures

12. Pesticide spray applications _____ be made just before a rain shower.

a.) should never, under any circumstances

b.) could with proper conditions (some protectant fungicide sprays are applied before and during rain)

c.) are always to

13. The best time of day for pesticide application, with wind conditions in mind, is:

a.) high noon

b.) early morning or evening

c.) mid afternoon

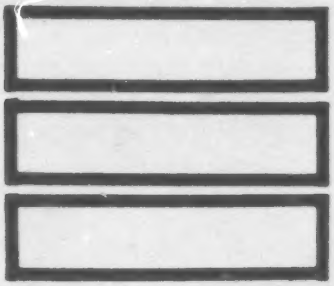
14. Safe pesticide disposal practices include:

a.) being cautious about surplus chemical elimination

b.) being cautious abcut the disposal of empty chemical containers

c.) both items above

15. Proper disposal of unopened pesticide containers would be the:

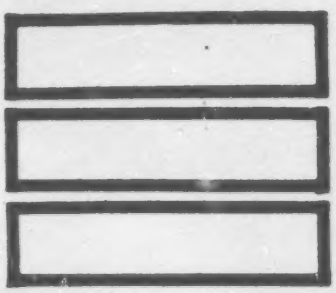


a.) burning of chemical and containers

b.) burying of chemical in the unopened container

c.) return to the manufacturer

16. If the manufacturer won't take your pesticide back, other methods of disposal include:

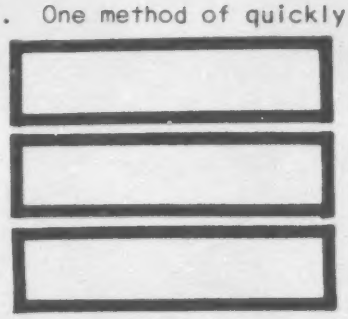


a.) dumping the chemical into the ground

b.) storage in 55-gallon drums with clamp covers

c.) mix with other pesticide formulas

17. One method of quickly breaking chemicals down is:

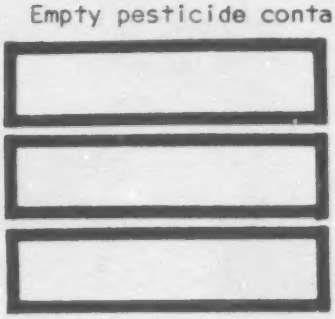


a.) Clorox or lime additives

b.) soap or detergent additives

c.) vinegar

18. Empty pesticide containers can be:

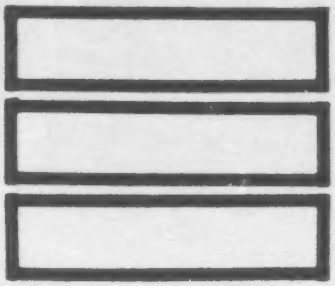


a.) tossed in an old empty building

b.) disposed in streams, ponds or fields

c.) considered as toxic as the chemical they once held

19. Disposal of pesticide containers could be classified:

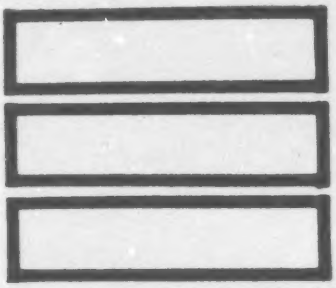


a.) only as those which will burn or bury

b.) in two ways, those that will be burned and those not to be burned

c.) in three main types: (1) those to burn, (2) those that will not burn, and (3) those containing mercury, lead, cadmium, arsenic or inorganic pesticides

20. Water used to rinse pesticide containers should be disposed:

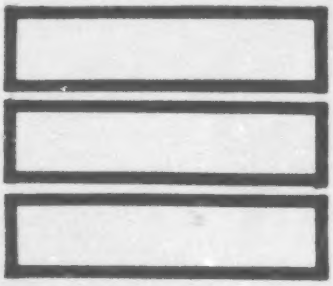


a.) on the ground

b.) in the sewer

c.) as you would the toxic chemical

21. When disposing 2,4D pesticide containers _____ burn.

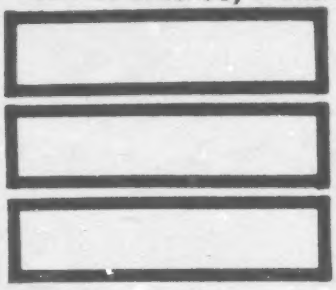


a.) always

b.) NEVER

a.) only burn if the smoke doesn't affect nearby plants and trees

22. Containers that will not burn are usually glass, metal or plastic, and they can be crushed, broken, or cut apart and buried _____ deep.



a.) 4 inches

b.) 24 inches

c.) 6 feet

23. Empty containers which held mercury, lead, cadmium, arsenic or inorganic materials should:

a.) be burned

b.) not be burned but stored in a 55-gallon drum

c.) be buried 24 inches deep

PROGRAMED INSTRUCTION UNITS
PESTICIDES APPLICATOR TRAINING PROJECT

UNIT V

BASIC SAFETY

Program Designed and Developed
by
James Buterbaugh, Ph.D.
University of Nebraska--Lincoln

DIRECTIONS: Using the special yellow marker, answer the following questions by lightly shading the boxed area which corresponds with your answer. If your choice is the best one, the box will look like this:

Shade area in box with special marker.

If your choice isn't the best one, the box will direct you to read specific information printed in the attached "ORANGE" section, and then try again.

1. When handling pesticides, a person must have:

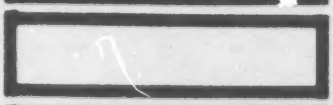
a.) developed an advance plan

b.) safety certificate

c.) a well ventilated truck cab

2. Before handling insecticides have the following available for emergencies:

a.) lime and Clorox


b.) Johnson's First Aid Kit

c.) water and soap/detergent

3. Select the safest, effective pesticide available with this information on the label:

a.) intended use

b.) expiration date

c.) cost

4. Clothing worn when pesticide is being applied must be:

a.) comfortable

b.) of little or no concern

c.) protective

5. Which time element is most important for pesticide application?

a.) time of day

b.) time when weather conditions are right

c.) time when temperature is high for the most insect kill

6. If in doubt whether poisoning has occured,:

a.) take a good stiff drink of alcoholic beverage

b.) immediately call a physician

c.) read the container label

7. A pesticide spill will be less likely if:

a.) heavy glass containers are obtained

b.) a person develops an advance plan for transporting

c.) the containers are packed carefully with other farm supplies

8. During pesticide applications, persons should:

a.) avoid direct exposure to the chemical

b.) build a personal immunity to the chemical

c.) not use a respirator unless the label calls for it

9. Unwashed hands that have handled chemicals must:

a.) not touch food or cigaretts

b.) not be wiped on clothing

c.) all of the above

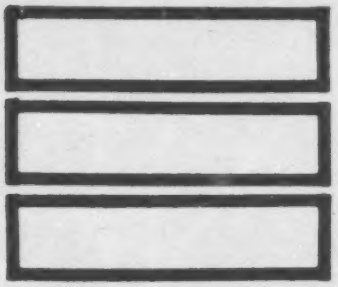
10. When handling hazardous pesticides always:

a.) work alone to protect others

b.) work in pairs

c.) supervise children who assist

11. Children, unauthorized persons and pets _____ protected from chemical contact in fields and around spraying equipment.

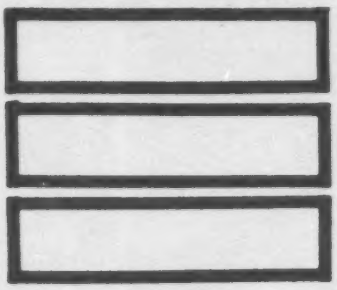


a.) should be

b.) MUST be

c.) sometimes are

12. Chemical overdoses will:

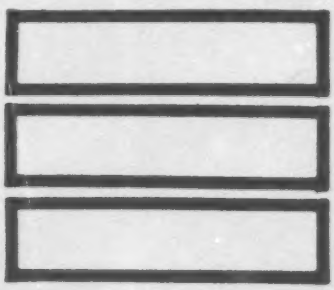


a.) really kill pests at all expense

b.) endanger humans, crops and wildlife

c.) ensure higher crop yields

13. When spraying with breezy conditions,:



a.) spray <u>upwind</u> from sensitive areas (lakes, houses, pastures and different crops)

b.) spray <u>downwind</u> from sensitive areas

c.) sensitive areas aren't likely to be covered

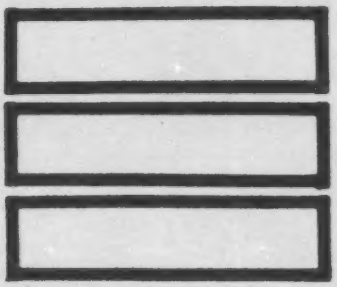
14. The best time to spray near living quarters is:

a.) before the noon meal

b.) early afternoon

c.) early morning or evening

15. Should spray be applied into or across streams, ponds, or lakes?

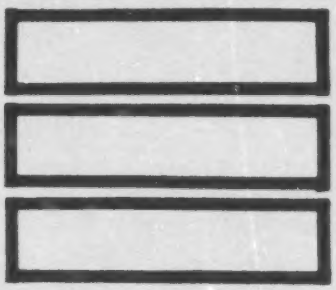


a.) NEVER

b.) sometimes

c.) only if the wind could drift

16. When a chemical-damaging drift is possible:

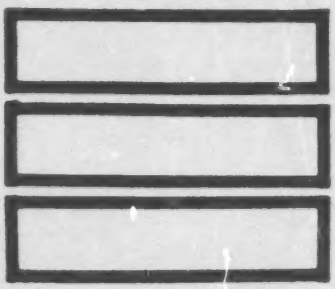


a.) dilute chemical strength

b.) avoid chemical application

c.) have liability insurance protection

17. If sprayer nozzles, hoses or lines clog, blow them out with your mouth:

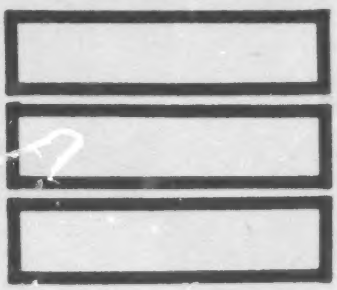


a.) only if using diluted chemical mixtures

b.) and then wash teeth with a soda solution

c.) never place mouth or skin in contact with chemical

18. The main reason to double check worn spray equipment is:



a.) to reduce safety hazards

b.) to reduce time spent in application

c.) to eliminate unnecessary worry

19. Chemical families attack the body:

a.) in the same way

b.) causing similar symptoms

c.) in different ways

20. General symptoms of mild poisoning or early symptoms of acute poisoning include:

a.) fatigue and nausea

b.) convulsions

c.) blurred vision

21. Pinpoint pupils may indicate:

a.) severe or acute poisoning

b.) moderate poisoning

c.) mild poisoning

22. Nausea, diarrhea, excessive saliva and stomach cramps may be symptoms of _____ poisoning.

a.) mild

b.) moderate

c.) severe or acute

23. If poison is spilled on the skin, it should be immediately _____ off to prevent less injury.

a.) wiped

b.) washed

c.) shook

24. If poison is spilled on a person, what is the best washing solution?

a.) soap/detergent and water

b.) vinegar and water

c.) only fast, running water

25. If the insecticide splashes in a person's eye,:

a.) wash the eye with soap and water

b.) wash for 15 minutes in clear running water

c.) use a drug store eye cleaner

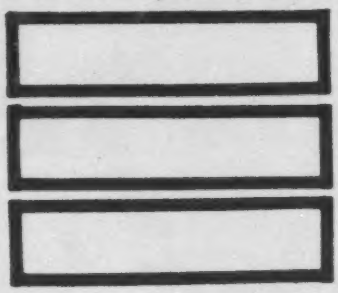
26. When a person has been overcome because of inhaling an excessive amount of poison, he should:

a.) take a drink of alcoholic beverage

b.) keep as active as possible to increase circulation

c.) keep as quiet as possible

27. After a person has swallowed poisons, vomiting should:

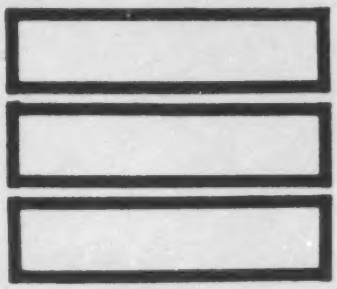


a.) always be induced

b.) usually be induced

c.) never be induced

28. Vomiting should never be induced if the victim has swallowed:

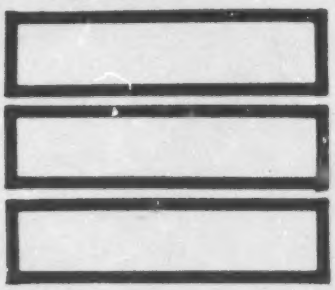


a.) corrosive poison

b.) petroleum products

c.) all of the above

29. Caution must be exercised when inducing a person to vomit in order to protect the:

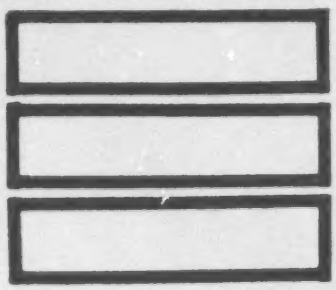


a.) stomach

b.) tongue

c.) mouth and lungs

30. Milk should be given to a poison victim in what quantity?



a.) one to two cups for 5 year olds and up

b.) a quart for persons younger than 5

c.) a quart for 5 year olds and up

31. What would be used to induce a victim to vomit?

a.) a glass of soapy water

b.) a glass of strong salt water

c.) either of above items

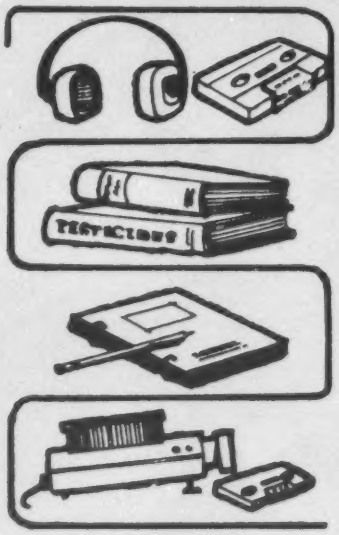
32. What compound absorbs many poisons at a high rate?

a.) coal powder

b.) activated charcoal

c.) baking soda

Pesticides Applicator TRAINING PROJECT...



Audio-Assisted Programmed Instruction

1975

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE
J. L. ADAMS, DIRECTOR

ORIENTATION SESSIONS

FOR CERTIFICATION OF PESTICIDE APPLICATORS

AUDIO TAPE WORKBOOK

Introduction

By the time planting begins in 1977, anyone who uses restricted-use pesticides, either as a commercial or as a private applicator, will have to be certified by the State Department of Agriculture.

The standards for this certification will be based on the regulations of the Environmental Protection Agency. Following these federal regulations, the State Department of Agriculture will administer examinations to certify that each applicant will have the practical knowledge of these EPA regulations.

These certification standards were set not only to protect you, but also to protect a significant part of our environment and wildlife that could fall prey to careless or unregulated use of pesticide products.

The state's examination for your certification as a pesticide applicator will be designed to see if you have the practical knowledge of the areas covered in the federal EPA regulations. This means you should not only be aware of pertinent facts, but know enough about certain areas that you can use knowledge in dealing with specific problems and situations.

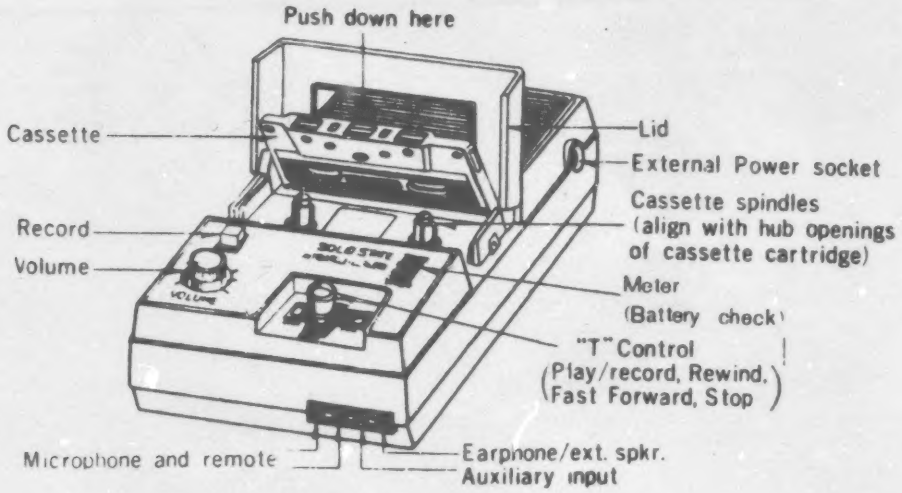
In short, you are going to have to show you are a competent applicator. You are going to have to show you are properly qualified for all the activities associated with the application of pesticides.

For your orientation to these areas of competency, you will have to demonstrate for certification, you will be using a kind of instruction that may be new to you. This workbook, along with the audio tapes that go along with it, will give you a chance to be an active partner in the instruction.

For each of the five sessions, you will listen to the audio tape, and use this workbook to write down information, solve problems, answer questions, or take your own notes as the material is described to you on the tape.

We will describe a situation for you on the tape, then ask you to write something in this workbook. Sometimes, we will just pause to let you answer your question while you leave the tape run. Other times, we will ask you to turn off the tape recorder until you have finished the problem in the workbook. You can rewind the tape anytime to go back over the material again.

If you have never used one of these audio cassette units before, you might want to go over these instructions, using one of the tapes in your package of material.



Cassette Insertion

Before attempting to insert or remove a cassette, make sure the T-control knob is moved to the STOP position. Open the cover of the cassette compartment. (If desired, the cover can be removed by lifting it back as far as possible.) Insert the cassette under the lip at the rear of this opening, with the tape slot toward the controls and the full reel of the tape on the left (look through the window of the cassette). Be sure the spindles are aligned with the hub opening in the cassette, then press down firmly on the cassette's front edge until it is seated securely. Now the lid may be closed and the recorder is ready to operate.

NOTE:

Cassette can be installed either side up, but will not fit properly in any incorrect position. After you have completed the first side, remove the cassette and reinsert with the other side up.

Playback

Insert the recorded cassette and move the T-control to the PLAY position, adjust the VOLUME control knob to get the desired sound volume. To end the playback, return the T-control to STOP. The tape will also stop automatically when the end is reached, shutting off power and releasing the mechanism.

Monitoring

For private listening to an already-recorded cassette, insert the plug of an eight-ohm earphone into the jack marked EAR and adjust the play volume to a comfortable level.

Fast Forward and Rewinding

For fast forward and rewinding of tape, shift the T-control to the positions marked FWD or REW. Return the T-control to STOP when the end of the tape has been reached. The 2623 does not automatically shut off in fast forward or rewind modes.

Areas of Competency

Required by EPA for Certification of Pesticide Applicators

(a) Competence in the use and handling of pesticides by a private applicator will be determined by procedures set forth below. State standards must conform and be at least equal to those prescribed herein. As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems and pest control practices associated with his agricultural operations; proper storage, use, handling and disposal of the pesticides and containers; and his related legal responsibility. This practical knowledge includes ability to:

Identification of Common Pests

(1) Recognize common pests to be controlled and damage caused by them.

Label Reading

(2) Read and understand the label and labeling information—including the common name of pesticides he applied; pest(s) to be controlled, timing and methods of application; safety precautions; any pre-harvest or re-entry restrictions; and any specific disposal procedures.

Application in Accordance With Label Directions

(3) Apply pesticides in accordance with label instructions and warnings, including the ability to prepare the proper concentration of pesticide to be used under particular circumstances taking into account such factors as area to be covered, speed at which application equipment will be driven, and the quantity dispersed in a given period of operation.

Environmental Considerations

(4) Recognize local environmental situations that must be considered during application to avoid contamination.

Basic Safety

(5) Recognize poisoning symptoms and procedures to follow in case of a pesticide accident.

Certification Procedures

(b) Such competence of each private applicator shall be verified by the responsible State agency through the administration of a private applicator certification system which ensures that the private applicator is competent, based upon the standards set forth above, to use the restricted use pesticides under limitations of applicable State and Federal laws and regulations. A certification system shall employ a written or oral testing procedure, or such other equivalent system as may be approved as part of a State plan.

Unit One

Identification of Common Pests

Use Audio Tape 1, Side A ("Identification of Common Pests") for this unit.

Follow the directions given to you on the tape. Each item will be described to you and time will be allowed for you to work out your solution. Read and solve each item only as you are told to do so on the tape.

Item 1:

Areas of Competency
Required by EPA for Certification of
Pesticide Applicators

1. _____
2. _____
3. Application in Accordance with Label Directions
4. Environmental Considerations
5. Basic Safety Procedures

Item 2:

_____

Testing shall be based on examples of problems and situations appropriate to the particular category or subcategory of the applicator's certification including the following as one of the areas in which competency must be demonstrated:

Common features of pest organisms and characteristics of damage needed for pest recognition.

Recognition of relevant pests.

Pest development and biology as it may be relevant to problem identification and control.

Item 3:

	Destructive Below the Soil	Destructive Above the Soil
Cutworms	☐	☐
Grasshoppers	☐	☐
Spider Mites	☐	☐
Wireworms	☐	☐
Corn Rootworm	☐	☐
Army Worm	☐	☐
Seedcorn Maggots	☐	☐
White Grubs (Grubworms)	☐	☐
European Corn Borers	☐	☐
Corn Root Aphids	☐	☐
Corn Leaf Aphids	☐	☐
Corn Sap Beetle	☐	☐
Corn Earworm	☐	☐
Greenbugs	☐	☐

Chemicals Recommended for Planting Application For Corn Rootworm Control

Dasanit 15G	Thimet 15G	Dyfonate 20G
Dyfonate 10G		Furdan 10G

Chemicals Recommended for Post Emergent Control of Corn Rootworm

Bux 10G	Diazinon 14G	Thimet 15G
Dasanit 15G	D-Syston 15G	MOCAP 10G
Dyfonate 10G	Furdan 10G	Dyfonate 20G

Item 4:

A chemical such as _____ will probably be more effective for the corn rootworm larvae because it kills when it is contacted by the insect.

Explain in your own words why you think this is true: _____

_____

_____

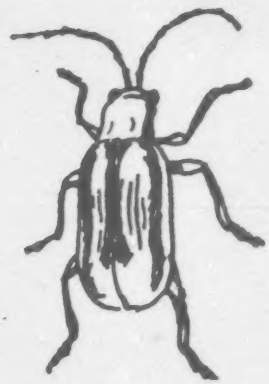
_____

_____

Item 5:

Varieties of Corn Rootworm Beetle

Picture 1



Picture 2

Picture 3

Cutworm

Suggested Chemical Controls for Cutworm before Planting

Aldrin (2 pounds per acre)

Heptachlor (2 pounds per acre)

Chlordane (4 pounds per acre)

Suggested Chemical Controls for Cutworm After Planting

Aldrin (1 pound per acre)

Heptachlor (1 pound per acre)

Chlordane (2 pounds per acre)

Item 6: Practical application situation.

Read over the situation you find in each of two of your fields. Together with the information you are given on the audio tape, see if you can isolate what insect you will have to control based on the damage being done.

FIELD 1

It is well into your growing season, but still quite a time before your corn has tasseled. You have 40 acres of corn which has been in corn production since 1971. Last year you noticed extensive silk damage at pollination. Kansas fields just south of you had heavy crop damage to their corn fields last year. Most of the surrounding fields are in either milo or wheat. The closest stubble field is by the creek a half section away. We will also assume--although it may seem to be a dangerous assumption to make in Nebraska now--that we have had adequate moisture during the spring and a mild wet summer.

Your first indication that something was wrong was when you noticed a few of the corn plants dying off in concentrated areas. You pull out a plant to examine the damage. The third and fourth rings of the roots have been eaten off.

Although you did not see any insects when you pulled out the plant, because of the symptoms, you can be sure your damage is caused by which of the following:

[ ] - Cutworms
[ ] - Corn Rootworm
[ ] - Wireworms
[ ] - Seedcorn Maggots
[ ] - Corn Root Aphids
[ ] - Butterflies

FIELD 2

You decided two years ago to put a 40 acre tract of your place next to the stubble field by the creek into corn production. You've kept the creek area the way it was for pheasant hunting. Last August you had quite a problem with corn rootworm beetle. Your application of Sevin last fall seemed to arrest the problem. And, let's assume we had a hard freeze this winter. Then, in spring, you notice you were kicking up a lot of moths when walking through your newly planted corn field. You first began to notice some die-off in the late spring and early summer. When you pulled up one of the plants, the stem had been completely chewed through above the roots.

Because of your bad luck with the corn rootworm beetle, your helpful neighbor thinks your problem now is the corn rootworm larvae. Do you agree with him?

If not, which of the following pests do you think you should try to control in this field?

- ☐ - Cutworms
- ☐ - Corn Rootworms
- ☐ - Wireworms
- ☐ - Seedcorn Maggots
- ☐ - Corn Root Aphids
- ☐ - Alligators

EUROPEAN CORN BORERS

Description and Damage

Adult corn borers are buff-colored moths that resemble many other kinds of night-flying moths. They are triangular-shaped at rest and about the size of a suit coat button.

Eggs are small, round and flat. They are laid in masses, overlapping much like small fish scales. Masses are about the size of the nail of your little finger. The eggs are white when first laid, but as the small borers develop inside the eggs, they darken.

Newly hatched borers are very small, about 1/16 inch long. They are white with a dark head. As they grow, they may become darker, almost greyish in color, but most remain light colored. Small dark spots can be seen on the borers.

The first brood of borers, usually in late June and early July, feeds on the leaf surface in the whorl of plants, leaving a "shot-hole" appearance on the leaves as they emerge from the whorls. When half grown, the borers enter the stalks.

In August, second brood borers often feed on pollen, leaf surfaces, in leaf mid-veins, or axils of leaves before boring into the stalks and cobs. Second brood borers often attack the plants extensively at the ear shanks, in the ears and the ear zone.

First brood borers reduce yield, but second brood borers cause most damage in broken stalks and fallen ears at harvest.

Life History

European corn borers spend the winter in the borer stage in corn stalks, and stalks of many other plants.

In the spring, the borer changes to a pupa, usually in May and early June. The moth emerges from the pupa in late May and early June.

First brood moths seek early-planted corn for egg laying. First brood borers begin to complete their feeding cycle and to pupate in July and early August.

Second brood moths emerge in late July and in August, and they prefer late-planted corn upon which to deposit eggs. After completing their feeding cycles, second brood borers hibernate in infested stalks.

GREENBUGS

Description and Damage

Light green or greenish-yellow with a narrow darker green stripe down the center of the back. Feet black and legs are green. Small "pipes" near the tail are green with black tips.

Greenbugs usually develop on the undersides of leaves. Small plants are often killed soon after greenbugs develop on them. The first evidence is yellowing, then browning of plants. Colonies developing on the undersides of leaves will cause reddish-brown spots visible from above.

Life History

Infestation of sorghum plants starts when winged forms of greenbugs arrive from states south of Nebraska, the wind being the primary method of movement.

After settling on the sorghum plants, the winged forms, which are all female, reproduce. The young, also all female, are born alive and most are wingless and remain on the plant. Seven days after birth they are mature and begin to reproduce.

Most greenbugs produce two or three young a day for a period of 14 days. Due to the fact that the young begin to produce more young in seven days, and most remain on the plant, immense populations can develop in a short time.

As numbers become high, a small percentage of new greenbugs develop wings and fly or are blown to other fields. Large flights of greenbuts from local infestations can occur almost any time in July, usually about mid-July.

Reproduction continues through the summer until a tiny wasp called a Lysa wasp deposits eggs in the greenbugs' bodies. The larva of the wasp kills the greenbugs, thus frequently controlling greenbug infestations in late July and early August.

After sorghum matures, greenbugs usually disappear, most of them being killed by parasites or lack of food plants. Greenbugs are not found after the first long period of freezing, about February 1st in most years.

Item 7:

Insects can be classified into two broad categories depending on the damage they do to crops. These two classifications, discussed on the tape, are:

1. _____

2. _____

Item 8:

List below three ways that chemicals act on insects to kill them:

1. _____

2. _____

3. _____

Unit Two

Label Reading

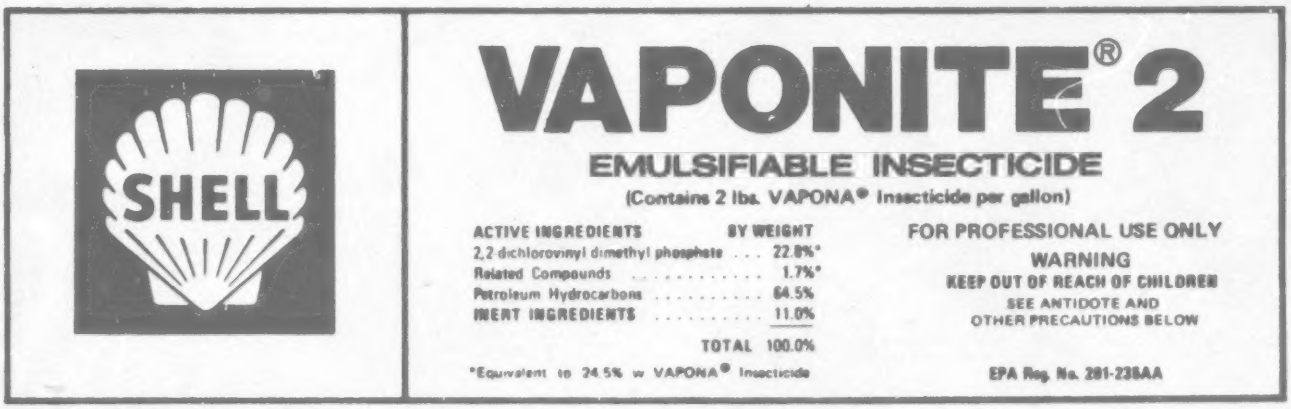
Use Audio Tape 1, Side B ("Label Reading") for this session.

Follow the directions given to you on the tape. Each item will be described to you and time will be allowed for you to work out your solution. Read and solve each problem only as you are told to do so on the tape.

Applicable EPA Regulations For this session

...As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems and pest control practices associated with his agricultural operations:

Label & labeling comprehension.
(a) The general format and terminology of pesticide labels and labeling;
(b) The understanding of instructions, warnings, terms, symbols, and other information commonly appearing on pesticide labels;
(c) Classification of the product, general or restricted; and
(d) Necessity for use consistent with the label.



Item 1: What is the product name on the label shown above?

_____

Item 2: Active ingredients: _____ ___%

_____ ___%

_____ ___%

Total Active Ingredients ___%

Inert Ingredients: _____ ___%

Total of Active and Inert Ingredients _____%

Categories	Signal Word Required on the Label	Categories of Acute Toxicity			Probable Oral Lethal Dose for 150 lb. man
		LD_{50}		LC_{50}	
		Oral	Dermal	Inhalation	
		(Parts per Million)			
Toxicity	2	3	4	5	6	7
I						
II						
III						
IV						

Notes

Item 3:

Indicate below all of the information you can find out from the label of this pesticide product.

Category: _____

Signal Word: _____

Acute Toxicity Rating: _____

Recommended Usage: _____

Other information you feel important: _____

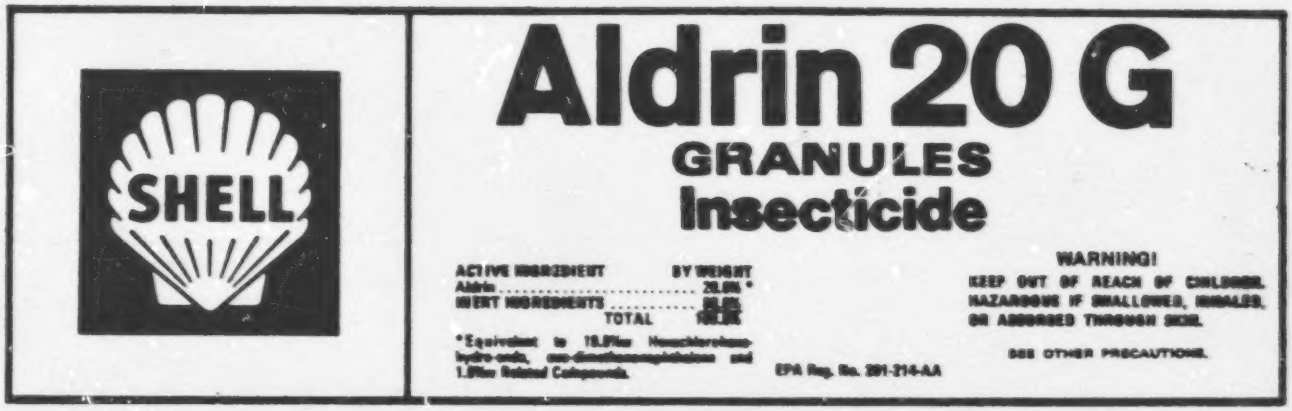
_____

_____

_____

Item 4:

Indicate below all of the information you can find out from the label of this pesticide product:



Category: _____

Signal Word: _____

Acute Toxicity Rating: _____

Recommended Usage: _____

Other information you feel important: _____

_____

_____

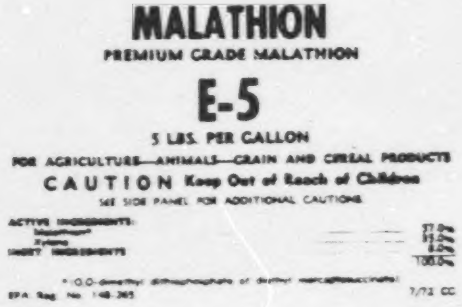
_____

_____

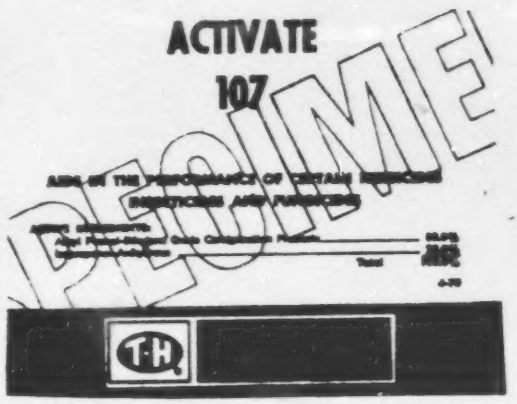
Item 5:

Indicate below all of the information you can find out from the label of this pesticide product:

Product A



Product B



Category: _____

Signal Word: _____

Acute Toxicity Rating: _____

Category: _____

Signal Word: _____

Acute Toxicity Rating: _____

In the space provided below, indicate in your own words how these two products differ, according to what you can find out by comparing the labels.

_____

_____

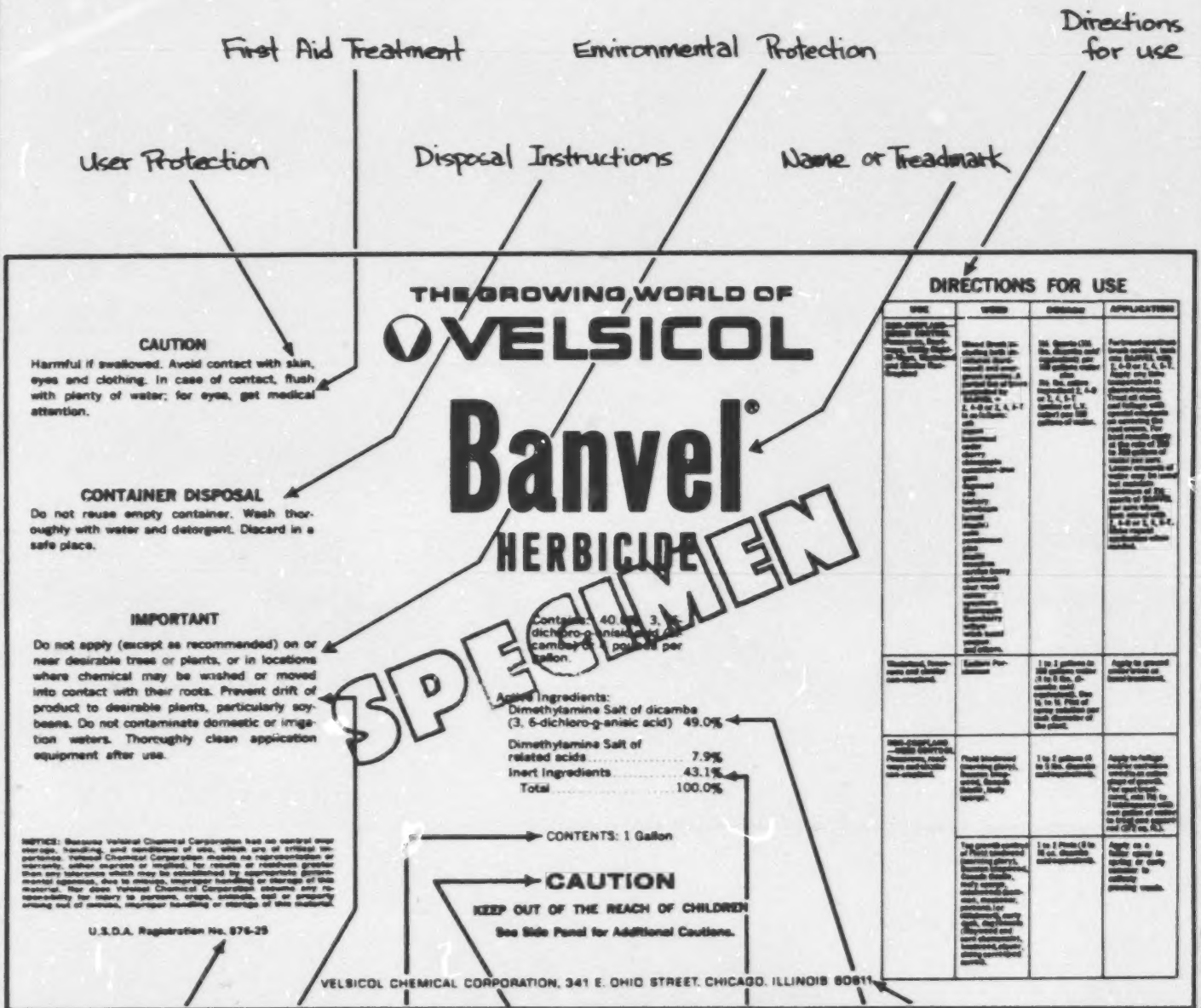
_____

_____

_____

_____

INFORMATION CONTAINED ON THE LABEL OF PESTICIDE PRODUCTS


First Aid Treatment
Environmental Protection
Directions for use
User Protection
Disposal Instructions
Name or Treadmark
THE GROWING WORLD OF
VELSICOL
Banvel®
HERBICIDE
SPECIMEN
CAUTION
Harmful if swallowed. Avoid contact with skin, eyes and clothing. In case of contact, flush with plenty of water; for eyes, get medical attention.
CONTAINER DISPOSAL
Do not reuse empty container. Wash thoroughly with water and detergent. Discard in a safe place.
IMPORTANT
Do not apply (except as recommended) on or near desirable trees or plants, or in locations where chemical may be washed or moved into contact with their roots. Prevent drift of product to desirable plants, particularly soybeans. Do not contaminate domestic or irrigation waters. Thoroughly clean application equipment after use.
Active Ingredients:
Dimethylamine Salt of dicamba (3, 6-dichloro-g-anisic acid) 49.0%
Dimethylamine Salt of related acids 7.9%
Inert Ingredients 43.1%
Total 100.0%
U.S.D.A. Registration No. 876-29
CONTENTS: 1 Gallon
CAUTION
KEEP OUT OF THE REACH OF CHILDREN
See Side Panel for Additional Cautions.
VELSICOL CHEMICAL CORPORATION, 341 E. OHIO STREET, CHICAGO, ILLINOIS 60611
DIRECTIONS FOR USE
Registration Number
Net Contents
Inert Ingredients
Name and Address of Producer
Hazard Statement
Signal Word
Active Ingredients

Unit Three

Application of Pesticides in Accordance with Label Directions

Use Audio Tape 2, Side A ("Application of Pesticides") for this session.

Follow the directions given to you on the tape. Each item will be described to you and time will be allowed for you to work out your solution. Read and solve each item only as you are told to do so on the tape.

Applicable EPA Regulations for this session

...As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems and pest control practices associated with his agricultural operations:

Application techniques. Factors including: (a) Methods of procedure used to apply various formulations of pesticides, solutions, and gases together with a knowledge of which technique of application to use in a given situation;

(b) Relationship of discharge and placement of pesticides to proper use, unnecessary use, and misuse; and

(c) Prevention of drift and pesticide loss into the environment.

Item 1:

Areas of Competency Required by EPA for Certification of Pesticide Applicators

1. Identification of Common Pests
2. Label Reading
3. _____
4. _____
5. _____

Item 2: The following formulas can be used to calibrate your equipment for spraying liquid pesticide products:

$$\frac{\text{Square Feet per Acre}}{\text{Length of Boom}} = \text{Travel to cover one acre}$$

Number of Test Run Lengths in One acre X Gallons Used in Test Run = Gallons that will be used per acre

NOTE: Remember there are 43,560 square feet to an acre.

Item 3:

Determine how many gallons of spray the equipment described for you on the tape will deliver per acre.

Length of boom: _____ feet

Distance of test run: _____ feet

Number of test runs to cover one acre: _____

Gallons of liquid used in test run: _____

ANSWER: Gallons delivered per acre: _____

Item 4:

Solve this problem: Suppose the formulation of a pesticide contains 4 pounds active ingredient per gallon and you want to apply 1/2 pound of active ingredient per acre. Your tank covers 8 acres.

You can use the following table in your calculations:

$$\frac{4 \text{ pounds}}{1 \text{ gallon}} = \frac{4 \text{ pounds}}{4 \text{ quarts}} = \frac{1 \text{ pound}}{1 \text{ quart}} = \frac{1 \text{ pound}}{2 \text{ pints}} = \frac{1/2 \text{ pound}}{1 \text{ pint}}$$

ANSWER: _____ pints of liquid should be added to to the tank in order to deliver 1/2 pound of active ingredient per acre.

Calibration of Granular Applicators

NOTES

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Rate of Application for Granular Pesticides To Apply One Pound Per Acre Feet of Row	
Percent Granules	Ounces per 1000 feet
10%	12
15%	8
14%	8.5
20%	6
25%	5

Item 5:

Follow along with the description on the audio tape as we work through this problem to determine the amount of granular pesticide to use:

You have 20% aldrin granules, you want 3 pounds of active aldrin per acre.

Your calculations should be based on this formula:

$$.20 \times A = 3 \text{ pounds}$$

$$A = \frac{3 \text{ pounds}}{.20}$$

$$A = 15 \text{ pounds}$$

Item 6:

Now, work this problem out on your own. After you have arrived at the answers asked of you on the tape, restart the tape to check your answers with ours.

You have 14% diazinon granules, you want 1 pound of active ingredient per acre.

$$\_\_\_\_\_ \times A = \_\_\_\_\_ \text{ pounds}$$

$$A = \frac{\_\_\_\_\_ \text{ pounds}}{\_\_\_\_\_}$$

$$A = \_\_\_\_\_ \text{ pounds}$$

Item 7:

Now, solve this problem situation:

You have 15% heptachlor granules, you want 3/4 pound active ingredient per acre.

ANSWER: _____ pounds of 25% heptachlor granules are needed to deliver 3/4 pound active ingredient per acre.

Additional Notes on This Session

Unit Four

Environmental Considerations

Use Audio Tape 2, Side B ("Environmental Considerations") for this session.

Follow the directions given to you on the tape. Each item will be described to you and time will be allowed for you to work out your solution. Read and solve each item only as you are told to do so on the tape.

Applicable EPA Regulations for this session

...As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems and pest control practices associated with his agricultural operations;

— *Environment.* The potential environmental consequences of the use and misuse of pesticides as may be influenced by such factors as: (a) Weather and other climatic conditions;
(b) Types of terrain, soil or other substrate;
(c) Presence of fish, wildlife and other non-target organisms; and
(d) Drainage patterns.

Item 1:

List below all the advantages to plant life you can think of by the proper use of pesticide products.

1. _____
2. _____
3. _____
4. _____
5. _____

List below some of the disadvantages to plant life that could result from the careless use or misuse of pesticide products.

1. _____
2. _____
3. _____
4. _____
5. _____

Item 2:

List below some of the advantages to using pesticides to control livestock pests.

1. _____

2. _____

3. _____

List below some of the disadvantages that could result from the careless use or misuse of pesticide products to control livestock pests.

1. _____

2. _____

3. _____

The Effect of Pesticides on Wildlife

THE FOOD CHAIN

Item 3:

Accumulative Pesticides

What does the term "Accumulative Pesticides" mean?

_____

_____

What effect do Accumulative Pesticides have on the environment?

_____

_____

_____

Item 4:

Nonaccumulative Pesticides

What does the term "Nonaccumulative Pesticides" mean?

_____

_____

_____

What effect do Nonaccumulative Pesticides have on the environment?

_____

_____

_____

Item 5:

Persistent Pesticides

What does the term "Persistent Pesticides" mean?

_____

_____

What effect do Persistent Pesticides have on the environment?

_____

_____

_____

Item 6: Factors That Cause Pesticides To Move Off Target

1. Careless Application
2. _____
3. _____
4. _____
5. _____

Item 7:

Weather Wise Application

Explain why you should avoid applying pesticides on windy days? _____

_____

_____

Explain why you should avoid application just before heavy rains: _____

_____

_____

Explain why early morning or early evening might be better times for application: _____

_____

_____

_____

Unit Five

Basic Safety

Use Audio Tape 3, Side A ("Basic Safety") for this session.

Follow the directions given to you on the tape. Each item will be described to you and time will be allowed for you to work out your solution. Read and solve each item only as you are told to do so on the tape.

Applicable EPA Regulations for this session

...As a minimum requirement for certification, a private applicator must show that he possesses a practical knowledge of the pest problems and pest control practices associated with his agricultural operations:

" *Safety*. Factors including: (a) Pesticide toxicity and hazard to man and common exposure routes;
(b) Common types and causes of pesticide accidents;
(c) Precautions necessary to guard against injury to applicators and other individuals in or near treated areas;
(d) Need for and use of protective clothing and equipment;
(e) Symptoms of pesticide poisoning;
(f) First aid and other procedures to be followed in case of a pesticide accident; and
(g) Proper identification, storage, transport, handling, mixing procedures and disposal methods for pesticides and used pesticide containers, including precautions to be taken to prevent children from having access to pesticides and pesticide containers.

Item 1: Indicate if the following statement is True or False.

As long as you wear appropriate clothing, including gloves, you can assume you have minimized exposure dnager to practically zero.

☐ - TRUE ☐ - FALSE

Explain your answer:_____

_____

_____

Item 2: Indicate if the following statement is True or False?

If a pesticide product has a relatively safe LC_{50} acute toxicity rating, itis probably safe for you to smoke during application.

☐ - TRUE ☐ - FALSE

Explain your answer: _____

_____

_____

Item 3: Indicate if the following statement is True or False:

If you feel sick during a spraying operation, the first thing you should do is to stop spraying and get away from your equipment.

☐ - TRUE ☐ - FALSE

Explain your answer: _____

_____

_____

Item 4: Indicate if the following statement is True or False:

If using a little bit of pesticide is an effective control, it stands to reason using twice as much will give twice as much control.

☐ - TRUE ☐ - FALSE

Explain your answer: _____

_____

_____

Item 5: Indicate which of the following precautions you should take if you cannot avoid spraying near the sensitive areas:

☐ - Avoid Windy Days

☐ - Spray Downwind from sensitive areas

☐ - Spray near houses, people or pets in the early morning or evening

☐ - Reassess the situation to see if you can use granular pesticides.

Item 6: Considering all of the conditions given to you in the statement below, indicate if you think this is a safe spraying procedure or if it is an example of an unsafe application of pesticides.

This year has been a bad year for you. You have to spray a 160 acre field, but can't really afford the money it's going to cost you to do it.

It suddenly occurs to you that you may have a very practical solution.

You decide to wait for a rather windy day, when the wind will be blowing away from your house and right into the 160 acre field.

Your solution is to run your spray equipment over just part of the field and let the wind carry your pesticide over the rest.

☐ - Safe application procedure ☐ - Unsafe application procedure

Item 7: Read over this situation and indicate in the space below how you would handle it.

You just backed your tractor into a 50 gallon drum of 2,4-D, breaking it open and causing most of it to spill near your wife's garden.

Indicate below what you would do to dispose of the spill:

_____

_____

_____

_____

_____

Item 8: Indicate whether you think the solution indicated in the situation described below is okay to use, by answering YES; or if it is an unsafe procedure, by answering NO

You have just finished your test run to calibrate your spray equipment. As you check over the nozzles on the boom, you notice that liquid is dripping out at one of the nozzle connections. You decide to allow for the amount of liquid dripping by adjusting the jet to spray a smaller amount out of that nozzle.

You feel you have a pretty good solution, but do you really?

☐ - YES ☐ - NO

Item 9:

a) One of your neighbors shows symptoms of poisoning. He has a fever, he is very thirsty, he is breathing hard and fast, and is vomiting. He has just sprayed his field with a pesticide product. Indicate below if these are symptoms or acute or of chronic poisoning.

☐ - Acute ☐ - Chronic

b) Another neighbor began complaining of headaches and dizziness and seems to have lost his appetite since he finished spraying his fields a couple of weeks ago. You notice he is a lot more irritable lately. Indicate below if these are symptoms of acute or of chronic poisoning.

☐ - Acute ☐ - Chronic

General Symptoms
of Pesticide Poisoning

Mild poisoning or early symptoms of acute poisoning:

Headache, fatigue, weakness, dizziness, restlessness, nervousness, perspiration, nausea, diarrhea, loss of appetite, loss of weight, thirst, moodiness, soreness in joints, skin irritation, eye irritation, irritation of nose and throat.

Moderate poisoning or early symptoms of acute poisoning:

Nausea, diarrhea, excessive saliva, stomach cramps, excessive perspiration, trembling, no muscle coordination, muscle twitches, extreme weakness, mental confusion, blurred vision, difficulty in breathing, cough, rapid pulse, flushed or yellow skin, weeping.

Severe or acute poisoning:

Fever, intense thirst, increased rate of breathing, vomiting, uncontrollable muscle twitches, pinpoint pupils, convulsions, inability to breathe, unconsciousness.

If you notice you have any of these symptoms after using a pesticide product that you did not have before any exposure to pesticides . . . .

CALL A DOCTOR IMMEDIATELY!

Item 10: Read the following first-aid procedures. Then indicate if you think they are right or wrong to use as first aid treatment for poison on the skin.

Wash the poison off fast. Drench the skin and clothing with water--using a shower, faucet, hose, even a pond if one is handy. Remove clothing. Cleanse skin and hair thoroughly with soap and water. Detergents and commercial cleansers are better than soap. Dry the victim and wrap him in a blanket.

☐ - RIGHT ☐ - WRONG

Item 11: Read the following first-aid procedures. Then indicate if you think they are right or wrong to use as first aid treatment for poison that has gotten into the eye.

Wash the eye out as quickly as possible. Hold eyelids open. Wash eyes with a gentle stream of clean running water. Continue washing for 15 minutes or more.

☐ - RIGHT ☐ - WRONG

Item 12: Indicate if the following situation demonstrated the right way or was it the wrong way to give first aid treatment for inhaled poison.

You notice your buddy is slumped over an open barrel of pesticide in the shed. You open the door as fast as possible and shout to him to walk over to you and get out of the shed as fast as possible. After he staggers out, you give him a belt of brandy to settle him down.

☐ - RIGHT ☐ - WRONG

Item 13: Your partner has just swallowed enough pesticide to show all of the immediate symptoms of acute poisoning. Which of the following should you do first?

☐ - Induce vomiting

☐ - Give artificial respiration

☐ - Wash the poison out immediately

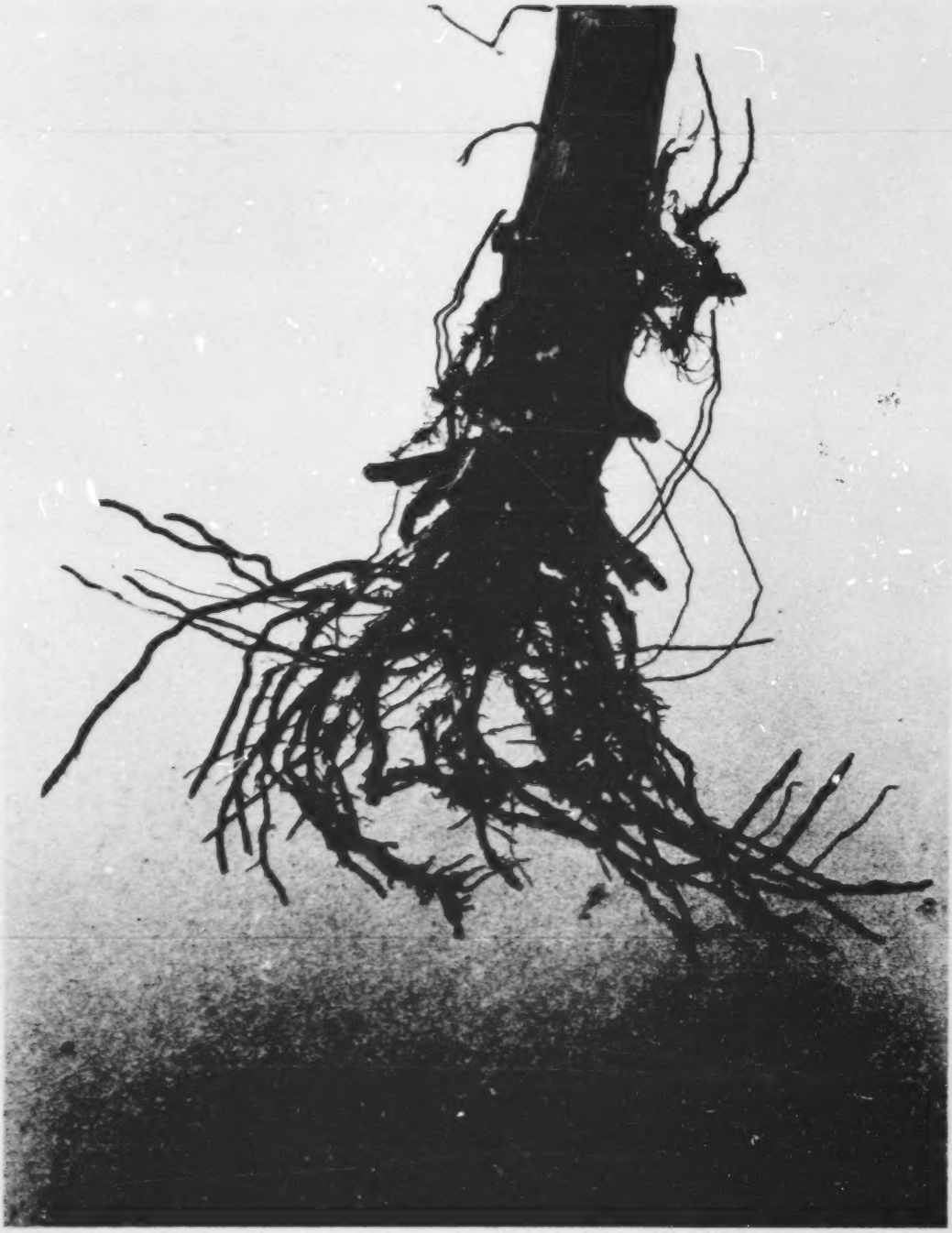
☐ - Pretend you didn't see him and begin to calculate how much more you will make if you don't have to split the profits.

Explain your answer: _____

_____

_____

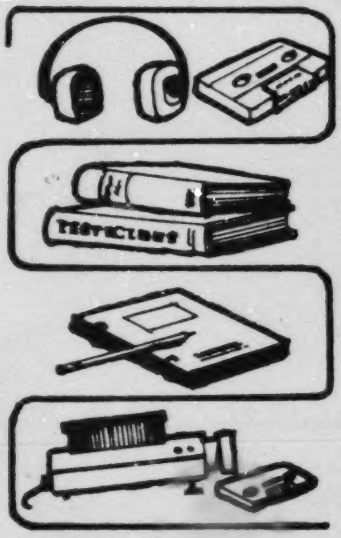
Picture 1



Picture 2

APPENDIX D

Pesticides Applicator TRAINING PROJECT...



Synchronized Slide-Tape Script

1975

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE
J. L. ADAMS, DIRECTOR

Introduction to Tape-Slide Series

Audio Script	Slide Descriptor
1. The Environmental Protection Agency now requires anyone using chemical pest controls to be licensed.	1. Map with words, EPA
2. Licensing of you, the farmer/ applicator, is a means of insuring your responsibility in the use of dangerous pesticides.	2. Aerial applicator
3. A license certifies that you are competent in the handling and application of all types of pesticides...	3. Cartoon of farmer holding certificate
4. and that you are aware of the possible hazards of pesticides to the safety of...	4. Lannate Pesticide Label
5. you, your family, your employees, your neighbors...	5. Farmers with county agent in hog lot
6. and your surrounding environment, including wildlife and waterways.	6. Geese near waterway
7. The series of slides and tapes to follow are designed to give you the knowledge you need to prepare for testing for a license.	7. Slide/tape synchronizer equipment

UNIT I - COMMON PESTS

Audio Script	Slide Descriptor
1. Introduction: This series of slides will describe common insects destructive to corn and sorghum in Nebraska.	1. Title Slide: Common Pests
2. Some insects attack plants below the ground; for example, the corn roctworm larva. These worms are white with a dark head and dark spot on the top of the tail. Nearly microscopic at hatch, they grow to about 1/2 inch long.	2. Close-up of corn root-worm larva
3. Corn rootworm larvae are most likely to damage continuous corn production fields. They tunnel inside corn roots, chewing the small roots off as they grow.	3. Root damage to cornstalk
4. Western and northern corn rootworms lay eggs in the late summer, depositing most eggs from the first of August through the first half of September. Eggs overwinter in the soil, hatching the following spring. Normally, egg hatch begins in late May or early June; however, during cool springs, hatch may be delayed. The larvae feed for about 30 days before pupating.	4. Chart: Corn Rootworm Life Cycle
5. If you practice crop rotation, insecticide prevention for rootworms is not necessary in most situations.	5. Tractor disking
6. However, in continuous corn production fields, insecticide use at planting or post-plant is necessary, if one or more beetles per plant were observed the previous August.	6. Corn root damage; hand holding stalk
7. Recommended for planting application are Dasanit 15G, Dyfonate 10G. Dyfonate 20G, Furadan 10G, Thimet 15G, and Landrin 15G.	7. Chart: For Planting Application

8. Post-emergent measures include Bux 10G, Dasanit 15G, Dyfonate 10G and 20G, Diazinon 14G, Di-Syston 15G, Furadan 10G, Thimet 15G, and MOCAP 10G.	8. Chart: Post-Emergent Application
9. Black cutworm larvae also attack the plant below the ground. They are grayish to black in color.	9. Close-up of cutworm larva
10. They cut small plants at or below the soil line and will chew into larger plants below soil line, causing the plant to die. Most feeding is done at night and generally below the surface near moist soil.	10. Cutworm and damaged cornstalk
11. Sandhills worms are light-colored. The damage they cause is usually restricted to sandy soils.	11. Close-up of sandhills cutworm
12. Most cutworms overwinter as worms or pupae in the soil. Moths emerge in the spring. Black cutworm moths deposit eggs most frequently on grasses, weeds, or other plants in low, damp areas, thus their common name, "overflow" worm. There are probably two generations every year.	12. Chart: Black Cutworm Life Cycle
13. Continuous, clean cultivated corn seldom suffers from cutworm infestation. Cutworms are most likely to be found in low-land fields with a history of infestations or in corn following sod or stubble fields.	13. Photo of cornfield and low-lying area
14. Pesticides suggested for use before planting are Aldrin (2 pounds per acre), Heptachlor (2 pounds per acre), or Chlordane (4 pounds per acre).	14. Chart: Before Planting
15. Aldrin (1 pound per acre), Heptachlor (1 pound per acre), or Chlordane (2 pounds per acre) are recommended for row spray application at planting.	15. Chart: At Planting Time

16. Title Slide: Corn and sorghum plants are also victims of insects that attack them above the soil.

16. Title: Insects That Attack Plants Above Ground

17. One such insect is the corn rootworm adult.

17. Photo: Four corn roootworm adults

18. The adults of the western corn rootworm are black and yellow. The color pattern will vary from distinct stripes to almost black with a yellow tip on the rear of the wing covers.

18. Close-up of western corn rootworm adult

19. Northern corn rootworm adults are tan to green in color without distinct stripes or spots.

19. Close-up of northern corn rootworm adult

20. Southern corn rootworm adults are yellow to greenish with six black spots on each side of the wing cover. They are also known as spotted cucumber beetles.

20. Close-up of southern corn rootworm adult on hibiscus plant.

21. Corn rootworm adults damage corn by feeding extensively on silks at the time pollen is being produced. They are most likely to be a problem in late planted corn.

21. Western corn rootworm beetles on ear of corn

22. Western and northern corn rootworm adults emerge from the pupae about the first of July in southern Nebraska, and soon after that in the northern counties. Southern corn rootworm adults overwinter in the adult stage, probably in states south of Nebraska. The adults migrate north in the spring to deposit eggs in the soil.

22. Chart: Corn Rootworm Life Cycle

23. Chemical controls should be applied when silk chewing is occurring at 25 to 50% pollen shed. Carbaryl (Sevin), ethyl or methyl parathion, EPN, Malathion, Malathion ULV, and Gardona, with applicable restrictions, are effective.

23. Chart: Controls at 25-50% pollen shed.

24. European corn borers in the adult stage are buff-colored moths, similar to many other kinds of night-flying moths. At rest, they are triangular-shaped and about the size of a suit coat button.	24. Close-up of male and female European corn borer adults
25. Eggs are small, round, and flat. They are laid in masses, overlapping much like small fish scales. The eggs are white when first laid, but as the small borers develop inside, they darken.	25. Close-up of egg mass on corn leaf
26. Newly hatched borers are very small, about 1/16 inch long, white with a dark head. Most remain a light color as they grow; small dark spots can be observed on borers.	26. Close-up of larvae hatching from egg mass
27. Damage by first brood borers consists of feeding on the leaf surface in the whorl of plants. The leaves emerge with a "shot-hole" appearance.	27. Close-up of borer damage to corn leaf
28. Second brood borers feed on pollen, leaf surfaces, in leaf mid-veins, or axils of leaves before boring into the stalks and cobs. Second brood borers cause damage from broken stalks and fallen ears at harvest time.	28. Man inspecting damaged corn field.
29. European corn borers spend the winter in the borer stage in corn stalks or in other plant stalks. In the spring, the borer changes to a pupa; the moth emerges from the pupa in late May or early June. First brood moths lay eggs on early-planted corn. First brood borers begin to complete their feeding cycle and pupate in July and early August. Second brood borer moths emerge in late July and August, preferring late-planted corn for egg-laying. Second brood borers hibernate in infested stalks, after completing their feeding cycles.	29. Chart: European Corn Borer Life Cycle

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30. Controls should be applied when first brood corn borer larvae are found in 50% of corn plants 36 inches or higher in extended leaf height.

30. Close-up of European corn borer larva

31. There is no reliable guide for controlling second brood borers. Consider an early harvest if second brood borers are present in large numbers.

31. Harvest scene

32. Suggested pesticides are Diazinon 14G, EPN 4G, Thimet 15G, Furadan 10G, Sevin 80 WP, and Diazinon AG 500.

32. Chart: Suggested Pesticides

33. Greenbugs take their names from their color, a light green or greenish-yellow with a narrow darker green stripe down the center of the back. The feet are black, the legs green. Small "pipes" near the tail are green with black tips.

33. Close-up of adult greenbug

34. Damage to plants is caused by colonies of greenbugs developing on the undersides of leaves. The first evidence is yellowing, then browning of plants. Reddish-brown spots will be visible from the upper side of the leaf.

34. Close-up of greenbug damage

35. Infestation of sorghum plants starts when winged forms of greenbugs arrive from states south of Nebraska, in May or early June, carried here by the wind. The winged forms are all female and reproduce soon after settling on the sorghum. The young are all females, born alive, and mostly wingless, remaining on the plant. Seven days later they are mature and begin to reproduce. Most greenbugs can produce two or three a young a day for a period of fourteen days. Immense populations can thus develop in a short time.

35. Greenbug damage to sorghum plant

36. As numbers become high, a small percentage of new greenbugs develop wings and fly or are blown to other fields. Such flights usually occur in mid-July. Reproduction continues through summer until a tiny wasp called a Lysa wasp deposits eggs in the greenbugs' bodies. Its larva kills the greenbugs, forming brown "mummies." Such parasitism frequently controls greenbug infestations in late July and early August. Greenbugs are not found after the first long period of freezing.

36. Chart: Greenbug Life Cycle

37. The young plant should be treated when visible yellowing is noticed, with greenbugs on lower leaves. The 6-inch to preboot plant should be treated before any entire leaves are killed.

37. Close-up of greenbugs on sorghum leaf

38. The pre-boot and larger plant should be treated when greenbug numbers are sufficient to cause loss of function of three or more lower leaves, and parasitism is less than 20 percent.

38. Sorghum plant

39. Di-Syston and Thimet granules appear to be more effective than sprays in controlling greenbugs. Dimethoate 267, Malathion 57% EC and Diazinon AG 500 sprays can also be used.

39. Chart: Pesticides

Unit II - LABEL READING

Audio Script	Slide Descriptor
1. Why Read the Label? You are likely to misuse a pesticide if you do not read and understand the label.	1. Title: Why Read the Label
2. Misuse means: you are violating the law; you are endangering your health and well-being; you could harm the environment; and your insurance could become void.	2. Chart: Misuse of Pesticides
3. Labels are not hard to read. They often contain words of a technical nature and the print may be small, but they usually contain words that are already familiar to you.	3. Korlan label
4. Labels must state what is contained in the pesticide product and the amounts of each. There are usually two sections--active ingredients and inert ingredients--divided so that you can quickly see what the active ingredients are. Inert ingredients are lumped together with the total percentage given. All active and inert ingredients must total 100 percent.	4. Label portion: Ingredients
5. Required on every label are precautionary statements, which must state clearly the particular hazards involved in the use of the pesticide. Precautions to be taken to avoid accident, damage, or injury are also included.	5. Label portion: Precautionary statements
6. Signal words, such as DANGER/POISON, WARNING, or CAUTION indicate the toxicity category of the pesticide. Toxicity simply means "how poisonous."	6. Poison symbol

7. The signal words will tell you whether the chemical is highly toxic, moderately toxic, or relatively non-toxic.	7. Toxicity table
8. This is an example of a pesticide in Category I. The label bears a skull and crossbones and the word POISON in red; the signal word DANGER; the sentence "Keep Out of Reach of Children," and an appropriate warning statement; an antidote statement; emergency first-aid instructions; and the directive, "If swallowed or if symptoms of poisoning occur, call a physician immediately."	8. Lannate L label
9. Pesticides in Category II are classed as being one-tenth as toxic as those in Category I. The signal word is WARNING. There is an appropriate warning statement and the sentence, "Keep Out of Reach of Children."	9. Warning statement
10. This pesticide is found in Category III and is one-tenth as toxic as those in Category II. Their labels must bear the word CAUTION, the sentence "Keep Out of Reach of Children," and an appropriate caution statement.	10. Korlan 24E label
11. Category IV pesticides have little toxicity and may not require a caution or antidote statement. If the pesticide is irritating to the skin, nose or throat, or eyes, the label should say so. The warning sentence, "Keep Out of Reach of Children" is also found on Category IV labels.	11. Marlate 50 label
12. Other information found on labels includes safe storage directions. It is important to secure pesticides from children and pets and to store them clean and free from spills to prevent cross-contamination.	12. Label portion: Storage directions

13. There will be a section of the label giving specific directions for use. Following these directions will protect you and others from contamination. Directions for use should include where to apply, how to mix, how much to use, the pests to be controlled, and what form of application to use.	13. Portion of Korlan label: Directions for use
14. In summary, thoroughly reading and understanding the label is important, not only for effective control of pests, but also to insure safety to you and the environment.	14. Farmers reading label on container
15. Become especially familiar with these portions of a label: active and inert ingredients;	15. Label portion: Ingredients list
16. signal words, warnings, and precautionary statements; and	16. Signal words
17. directions for use.	17. Label portion: directions for use
18. Knowing these will equip you to act efficiently and quickly in an emergency. You may even save a life!	18. Cartoon: Emergency situation

UNIT III - CALIBRATIONS

Audio Script	Slide Descriptor
1. Even if you have the right mixture of pesticide in your spray tank, you can still apply the wrong amount of pesticide. You need to know at what rate your equipment is applying the pesticide to the target.	1. Title: Why Calibrate?
2. To accurately calibrate your sprayer, follow the six steps given here. First, clean your equipment. It is essential that all nozzles, screens, strainers, pumps, and hoses be clean before calibrating sprayer delivery. Worn or rusted parts should be replaced.	2. Farmers working on spray equipment
3. Measure the length of the boom in feet. Let's assume the boom is 16 feet long.	3. Field shot of tractor spraying
4. Calculate the distance to travel to spray one acre by dividing the length of the boom into 43,560, the square feet in an acre. The result will tell you how many feet to travel to cover one acre. With a 16-foot boom, it will be necessary to travel 2722 feet to spray one acre.	4. Chart: 43,560 ÷ 16 = 2722
5. Measure a given distance for the test run. In thiscase, measure one-fifth of 2722 feet, or 544 feet.	5. Chart: Marked area in grid.
6. Fill tank with water, set the sprayer as you would while spraying in the field. Travel at a speed that would normally be used. Spray water over the measured distance just as it would be sprayed over the field. In this case, the measured distance is 544 feet.	6. Cartoon: Tractor spraying for 544 feet.

7. Measure the number of gallons of water required to fill the tank. If it requires 2 gallons of water for the 544-foot course, multiply by five to find out how much is required to spray one acre. In this case, 10 gallons of water is needed. For every 10 gallons of water the tank holds, add the number of pounds, pints, or quarts of insecticide recommended per acre.	7. Chart: 2 gallons x 5 = 10 gallons
8. In summary, after cleaning equipment, measure the length of the boom.	8. Chart: Boom length = 16 ft.
9. Divide the length of the boom into 43,560.	9. Chart: 43,560 ÷ 16 = 2722
10. Measure one-fifth of 2722 feet.	10. Chart: 2722 ÷ 5 = 544
11. Spray water over measured distance.	11. Chart: 2 gallons of water for 544-foot course
12. Measure number of gallons of water required to fill the tank.	12. Chart: 2 x 5 = 10
13. Since 544 feet is one-fifth of an acre, multiply by five to find out total required to spray one acre.	13. Summary chart
14. Add correct amount of insecticide recommended per acre.	14. Farmer measuring pesticide
15. Even after your sprayer is calibrated, you should recheck it often. Be sure you are spraying the same number of acres for each tankful as you figured on. If you find that you are spraying more acres or fewer acres than you figured on, you should stop spraying immediately, and recalibrate. If you have figured wrong or your sprayer changes its delivery rate, you will be able to catch it before you make a major mistake.	15. Title: Check for Mistakes
16. There are three methods for changing the delivery rate. One is by changing the pump pressure. Lower pressure means less spray delivered; higher pressure means more spray delivered. This is <u>not</u> usually a good method because a pressure change will change the nozzle pattern.	16. Chart: Delivery Rate Can Be Changed by Regulating the Pump Pressure

17. You can change the speed of your sprayer. Slower speed means more spray delivered; faster speed means less spray delivered. This may be a practical method for small changes in number of gallons, but <u>not</u> for large delivery changes.	17. Cartoon: You Can Change Speed of Your Sprayer
18. You can change the discs or jets in the nozzles to change the amount each nozzle delivers. The larger the hole in the disc, the more spray delivered. <u>This</u> is usually the preferred method.	18. Cartoon: You Can Change the Discs or Jets in the Nozzles
19. The easiest and most accurate method of calibrating granular applicators is by collecting the granules from each delivery tube while the equipment is being driven at field speed.	19. Title: Calibrating Granular Applicators
20. Granules should be weighed from each row to determine the amount applied on 1000 feet. The simple steps for calibrating are . . .	20. Cartoon: Weighing for 1000 Feet
21. first, set rate control adjustment on applicator according to the manufacturer's instructions for the granules that are used.	21. Chart: Set Rate Control Adjustment
22. Add granules to hopper.	22. Add Granules to Hopper
23. Attach paper or plastic bags to each delivery tube for each row.	23. Attach Paper or Plastic Bags
24. Travel 1000 feet.	24. Travel 1000 Feet
25. Remove bags and weigh each separately.	25. Remove Bags and Weigh Each
26. Readjust equipment until each tube is delivering the correct amount per 1000 feet of row.	26. Readjust Equipment

27. Here is a summary of the six steps to calibrate granular applicators.

27. Summary Chart

28. This chart gives the amounts of granules usually recommended per 1000 feet of row.

28. Chart:

Percent granules	Ounces/ 1000 feet
10%	12
15%	8
14%	8.5
20%	6
25%	5

29. Inexpensive postage scales or diet scales can be used to weigh granules. These are good investments, because improper calibration can result in higher costs, poor protection, crop injury, or illegal application.

29. Postage scales

UNIT IV - ENVIRONMENTAL CONSIDERATIONS

Audio Script	Slide Descriptor
1. For years pesticides have been used to control pests which could be harmful to man. Rats carrying plague or mosquitoes carrying malaria are good examples. Control programs are necessary today, especially in crowded cities and countries with large populations. However, pesticides can be harmful, too. Any pesticide which is off-target is a pollutant and can be dangerous. Misuse or carelessness can cancel all of the benefits of any pesticide.	1. Cartoon: Rat and mosquito
2. With the help of pesticides, diseases, insects, and other plant pests can be greatly reduced. Less land must be tilled to produce higher yields and better crop quality. Good farm land may become unfit for crops, though, if overdoses of pesticides are applied. The crop may absorb the pesticides from the soil and be over the set tolerance at harvest. Or the pesticide may kill all or most of the plant life, making the land useless for farming.	2. Field of corn
3. Pesticides also protect livestock from the constant irritation of harmful and annoying pests. The quantity and quality of livestock products--milk, meat, etc.--are improved when the pests are controlled. Pesticide drift onto forage and pasture land or into drinking water can poison livestock. Once taken into the animal's system, these pesticides can also lead to illegal residues in meat and byproducts of the animal. They may be unfit for human consumption.	3. Feedlot

4. Pesticides can be harmless to wildlife when used carefully and on target. They may even aid wildlife by controlling runaway pests which could harm them. Pesticides can also be poisonous to wildlife. The toxicity of every chemical to every animal is not known. A pesticide that is only slightly toxic to one living thing may be very toxic to another. A pesticide that is relatively harmless to birds may be highly poisonous to fish or mammals.

4. Fish kill

5. Wildlife are also important because of their place in the food chain. The food chain is a way of describing how all animals depend on one another. Each animal has a place in the chain depending on the type of food it eats. Animals which eat only plant materials are at the bottom of the chain. Animals which eat these plant-eaters are on the next level. The animals which eat meat are at the top of the chain. In this complex chain, each animal has an important place. The loss of any animal disrupts the whole chain.

5. Cartoon: Food Chain

6. Some pesticides can build up in the bodies of animals, including man. These are called accumulative pesticides. The chemicals can build up in an animal's body until they become harmful to it. These pesticides also can accumulate in the food chain. Meat-eaters feeding on other animals with built-up pesticides may receive high doses of pesticides. If they feed on too many of these animals, the meat-eaters can be poisoned without ever directly contacting the pesticide. The build up through the food chain can injure animals which aid man.

6. Title: Accumulative Pesticides

7. Many pesticides do not build up in the bodies of animals or in the food chain. These are non-accumulative pesticides. These chemicals usually break down rapidly into other, relatively harmless materials. Organophosphates, for example, may have high toxicity at first and may cause local kills, but they do not accumulate in the environment. Usually pesticides which break down quickly in the environment are least harmful to it.

7. Title: Non-accumulative Pesticides

8. Persistent pesticides stay in the environment for long periods of time. Persistent pesticides do not necessarily accumulate in animals' bodies or in the food chain. Some pesticides, for example, atrazine, persist in the soil but do not seem to build up in animals. Thus, they give long term control, but do not slowly poison wildlife.

8. Title: Persistent Pesticides

9. Pesticides are often used on plants to protect them or maintain their beauty. However, pesticides can injure plants; such injury is called phytotoxicity and ranges from slight burning or browning of the leaves to death of the entire plant.

9. Wheat field with chemical burn

10. Movement, pesticides which drift off-target during application, are a great threat to desirable plants and trees. Care must be used to avoid drift.

10. Spray plane

11. But pesticides can move in other ways, too. Some are carried off target by rain and runoff water and injure plants in the water's path.

11. Heavy run-off

12. Other pesticides may move through the soil to surrounding areas and cause injury in this way.

12. Cartoon: Pesticides May Move Through the Soil

13. Certain formulations of pesticides vaporize easily and the vapor can drift a long way. This vapor can settle on desirable plants and trees, causing severe damage. If plant injury could be a problem, try to choose a pesticide and formulation which tend to remain on the target area.

13. Beehives

14. Weather-wise application can reduce pesticide hazard to the environment. A good applicator checks the weather conditions carefully before beginning spray operations. Not only do a few simple precautions protect the environment, but they save the applicator money and time, since pesticides which do not reach the target areas are wasted.

14. Drawing: Tractor Spraying

15. High winds increase drift and result in loss of pesticides on treated areas. Drifting pesticides increase the possibility of injury to wildlife, pollinators, and domestic animals. They may settle on forage, pasture, or wildlife areas, or contaminate water.

15. Drawing: Wind drift

16. Pesticide application on quiet days reduces the hazards of inhalation and contact to the applicator and the bystander. Drift onto sensitive crops can also be avoided in this way. The applicator is highly responsible for any injury or money loss on crops due to pesticide drift. Don't take a chance by spraying in the wind.

16. Drawing: Spray drift

17. Spray applications should not be made just before a heavy rain, because the pesticide washes off, thus not controlling the pest. Heavy rains cause runoff and tend to wash the pesticide away from target areas. The runoff can carry the pesticide onto sensitive

17. Heavy run-off

crops and also often reaches farm ponds, streams, and waterways.

18. Wind speed is usually lowest in the early morning or evening. At these times of the day, drift is greatly reduced. Children and domestic animals are less likely to be in sprayed areas during these hours. Avoiding full daylight hours lessens the contact danger to wildlife who often visit crop lands only during the day.

18. Farm shot with field

19. As an applicator, you have two disposal problems. First, you must safely dispose of surplus pesticides that you have no use for. Second, you must safely dispose of empty pesticide containers. Careless disposal practices are a common cause of pesticide misuse and environmental contamination.

19. Cartoon: Man loading old containers

20. Pesticides which are still in the original, unopened container may be returned to the manufacturer.

20. Cartoon: Farmer returning cartons to dealer

21. If you mix too much pesticide for a job, try to find other areas with the same problem and use up any extra tank mix or rinse water on these. Otherwise, spray small amounts of extra tank mix over an area where you are certain it can't do any harm.

21. Drawing: Farmer dumping spray tank

22. Add Clorox or lime to the surplus tank mix before spraying to aid in breaking the chemical down quickly.

22. Cartoon: Add Clorox or lime

23. If the manufacturer won't take back your extra concentrates and/or you cannot use up your pesticides, you must find other safe ways to dispose of them. Store your extra pesticides in your regular locked storage area while

23. Drawing: Storage area

you are waiting to dispose of them legally. Keep them in their original containers with the labels, if possible.

24. Otherwise, 55-gallon drums with clamp covers make good storage containers for smaller empty containers or other surplus pesticides.

24. Drawing: Man loading drum

25. Empty pesticide containers are not really "empty," since they contain small amounts of pesticides even after they have been rinsed out properly. Never toss them in streams, ponds, fields, or empty buildings. Be able to account for every container you used for a job.

25. Cartoon: Dumping cartons in landfill

26. Dispose of all pesticide containers carefully and properly. You should separate the empty containers for disposal into three main types:

26. Dumping and covering cartons in landfill

27. those that will burn;

27. Cartoon: Those that will burn

28. those that will not burn;

28. Cartoon: Those that will not burn

29. and those that contain mercury, lead, cadmium, arsenic, or inorganic pesticides.

29. Chemical symbols

30. All empty containers, regardless of their type, should be rinsed three times before disposal. Treat the rinse water like a surplus pesticide and dispose of it properly. Never dump rinse water on the ground!

30. Cartoon: Rinse and drain containers 3 times

31. Burnable containers are usually wood, cardboard, or paper. Small quantities of these may be burned if local laws allow burning. Never burn containers that hold 2,4-D type weed killers. The smoke from such a fire could cause serious damage to nearby plants and trees.

31. Drawing: Man burning cartons

32. Non-burnable containers are usually glass, metal or plastic. Containers which cannot be returned to the manufacturer can be crushed, broken or cut apart, and buried 24 inches deep in an isolated location away from water supplies.

32. Drawing: Men crushing and burying cans

33. Do not burn empty containers which held mercury, lead, cadmium, arsenic or inorganic materials. They may be crushed and stored in a 55- gallon drum (separate from any drums containing regular nonburnable pesticide containers) until state and federal laws are checked for proper disposal.

33. Cartoon: Do Not Burn!

UNIT V - BASIC SAFETY

Audio Script	Slide Descriptor
1. A few safety precautions when handling pesticides may save you much grief.	1. Title: Safety Precautions
2. Plan ahead; be sure that plenty of soap and water or detergent and water are nearby for emergencies and cleanup.	2. Drawing: Soap, water and
3. Check the label and wear all the protective gear necessary.	3. Split photo: Good and bad spraying gear.
4. Choose a time when weather conditions are right.	4. Field shot
5. Choose the safest effective pesticide available. Be sure the intended use is on the label.	5. Drawing: Pesticide containers
6. Do not work in drift, runoff or spray unless properly protected. Do not wipe your hands on your clothes if chemicals have been spilled on your gloves; they may soak through to your skin.	6. Man spraying in orchard
7. Do not blow out clogged hoses, nozzles, or lines with your mouth. Never eat, drink or smoke when handling pesticides; wash your face and hands thoroughly first.	7. Cartoon: Don't!
8. When working with pesticides day after day, even moderately toxic chemicals can poison you. Consider using protective equipment, especially a respirator, even if the label doesn't call for it.	8. Drawing: Respirator
9. Watch out for others, too. Supervise your employees and be sure they follow all safety rules. Always work in pairs when handling hazardous pesticides.	9. Cartoon: Watch out for others!

10. If you feel sick, don't try to "finish up" the job. Get out of the area and get help fast!	10. Cartoon: Man at doctor's office.
11. Keep children, unauthorized persons, and pets out of the areas to be sprayed. Do not let children play around sprayers, dusters, filler tanks, storage areas, or old pesticide containers.	11. Cartoon: Children playing on spray equipment.
12. Use the proper rates. Overdoses won't kill pests twice, but may injure humans, crops, or wildlife and are misuses.	12. Korlan 24E label
13. Avoid spraying near apiaries, lakes, streams, pastures, houses, playgrounds, or sensitive crops whenever possible. If you must spray, avoid windy days and always spray downwind from the sensitive area. Consider spraying near living quarters in the early morning or evening when people and pets are least likely to be exposed. Never spray directly into or across streams, ponds, or lakes.	13. Cartoon: Farmer spray-near house.
14. Avoid spills, runoffs, and drift. Pesticides which fall anywhere but on the target area can injure crops, people and the environment. Avoid applying chemicals when drift or runoff is likely to occur; for example, in high winds or heavy rains. Choose application equipment and formulations that will minimize drift and runoff hazards.	14. Cartoon: Spraying in windy rainstorm

15. Poor maintenance and careless use of equipment can add to hazards. Check your equipment carefully and be sure it is working properly before you begin. Use the correct nozzles, pressure, and droplet size to avoid drift.

15. High rig spraying equipment

16. Be sure there are no leaks in the tank. Check for leaky connections and worn spots in hoses that could burst and spray you with poisonous sprays.

16. Cartoon: Leaky tank

17. The spray tank should have a tight lid so that splashing cannot occur and spray materials will not leak onto the ground.

17. Farmer spraying field

18. When the tank is being filled, you should stay with it; a tank that is not watched will often run over and cause pesticide spill on the ground, into a stream, or back-siphoning into a well.

18. Farmer loading tank

19. Machinery should be shut down if you find it necessary to adjust or repair any moving parts.

19. Farmers adjusting machinery

20. Unfortunately, all pesticide poisoning symptoms are not the same. Each chemical family attacks the body in a different way.

20. Poison symbol

21. However, there are some general symptoms to look for. Mild poisoning may be indicated by headache, fatigue, weakness, dizziness, restlessness, nervousness, perspiration, nausea, diarrhea. . .

21. List: Symptoms of Mild Poisoning

22. loss of appetite, loss of weight, thirst, moodiness, soreness in joints, skin irritation, eye irritation, irritation of nose and throat.

22. List continuation

23. Symptoms of moderate poisoning include nausea, diarrhea, excessive saliva, stomach cramps, excessive perspiration, trembling, no muscle coordination, muscle twitches . . .

23. List: Symptoms of Moderate Poisoning

24. extreme weakness, mental confusion, blurred vision, difficulty in breathing, cough, rapid pulse, flushed or yellow skin, and weeping.

24. List continuation

25. All of the symptoms listed may also be signs of early acute poisoning.

    Symptoms of acute or severe poisoning are fever, intense thirst, increased rate of breathing, vomiting, uncontrollable muscle twitches, pinpoint pupils, convulsions, inability to breathe, and unconsciousness.

25. Symptoms of severe poisoning

26. If you are in doubt whether poisoning has occurred, let a doctor decide!

26. Cartoon: Emergency situation

27. Follow these steps for first aid in a pesticide poisoning emergency.

27. Title: First Aid for Pesticide Poisoning

28. Drench skin and clothing with water. Remove clothing. Cleanse skin with soap and water. Dry and wrap in a blanket.

28. Title: Poison on the Skin

29. It is most important to wash the eye out as quickly as possible. Hold eyelids open, wash with a gentle stream of clean running water. Continue washing for 15 minutes or more. Do not use chemicals in the wash water, as they may increase the extent of the injury.

29. Title: Poison in the Eye

30. If victim is in enclosed space, do not go in after him without an air-supplied respirator. Carry patient to fresh air immediately. Do not let him walk!

30. Title: Inhaled Poisons

31. Open all doors and windows. Loosen all tight clothing. Apply artificial respiration if breathing has stopped or is irregular.

31. Cartoon: Man lying in closed area.

32. Keep patient as quiet as possible. If he is convulsing, watch his breathing and keep him from falling or striking his head. Keep his chin up so his air passage will remain free for breathing. Prevent chilling by wrapping in blankets, but do not overheat. Do not give alcohol in any form.

32. Cartoon: Doctor tending to prone victim

33. The most important decision you must make when aiding a person who has swallowed a pesticide is to make him vomit or not.

33. Title: To Vomit or Not to Vomit

34. Never induce vomiting if the victim is unconscious or in convulsions. The victim could choke to death on his vomitus.

34. Don't Induce Vomiting If Victim Is Unconscous.

35. Never induce vomiting if the victim has swallowed a corrosive poison. A corrosive poison is a strong acid or alkali. The victim will complain of severe pain and have signs of severe mouth and throat burns. A corrosive poison will burn the throat and mouth as severely coming up as it did going down.

35. Cartoon: Never Induce Vomiting

36. Never induce vomiting if the person has swallowed a petroleum product, that is, kerosene, gasoline, oil, or lighter fluid. Most pesticides which come in liquid formulations are dissolved in petroleum products.

36. Cartoon: Do Not Induce Vomiting

37. There are exceptions to the times when vomiting should not be induced: if concentrates of highly toxic pesticides are swallowed, induce vomiting immediately. If the victim has swallowed a dilute form of any formulation, he should be forced to vomit immediately.

37. Cartoon: Exception - Induce Vomiting

38. Do not waste a lot of time trying to induce vomiting. Use it only as a first aid until you can get the victim to a hospital. Make sure the victim is lying face down or kneeling forward; do not let him lie down,as vomitus could enter the lungs and do more damage.

38. Title: How to Induce Vomiting

39. Give the patient large amounts of milk or water. One to two cups for patients up to five years old; up to a quart for victims five years and older.

39. Cartoon: Measurement of milk for different age groups.

40. Place your finger or the blunt end of spoon at the back of the throat. Do not use anything sharp or pointed! A glass of soapy water or strong salt water will also cause vomiting.

40. Cartoon: Showing how to induce vomiting.

41. Collect some of the vomitus for the doctor; he may need it for chemical tests.

41. Cartoon: Collect vomitus sample in bag for doctor.

42. Activated charcoal is found in aquarium filters and may be purchased from a drug store.

42. Box of activated charcoal

43. Mix with water into a thick soup for the victim to drink. It acts as a sponge in the stomach. This should be used only after other first aid remedies are followed.

43. Bowl of charcoal soup.

APPENDIX E

Information Packet for County Extension Agents

SCHEDULE FOR ADMINISTERING INSTRUCTIONAL MATERIALS FOR PESTICIDE TRAINING PROJECT

Robert M. Voboril
Platte County - Columbus - February 18, 1975 - 1:00-5:00 p.m.

Donald C. Spitze
Wayne County - Wayne - February 19, 1975 - 1:00-5:00 p.m.

William R. Pedersen
Custer County - Broken Bow - February 24, 1975 - 1:00-5:00 p.m.

Fred M. Schmidt
Keith-Arthur Counties - Ogallala - February 25, 1975 - 1:00-5:00 p.m.

Monte D. Hendricks
Scotts Bluff County - Scottsbluff - February 26, 1975 - 1:00-5:00 p.m.

A. Neil Dawes
Jefferson County - Fairbury - February 18, 1975 - 1:00-5:00 p.m.

Robert G. Wilson
Nemaha County - Auburn - March 7, 1975 - 1:00-5:00 p.m.

Paul L. Swanson
Adams County - Hastings - March 11, 1975 - 1:00-5:00 p.m.

Robert N. Klein
Red Willow County - McCook - March 12, 1975 - 1:00-5:00 p.m.

James E. Novotny
Dodge County - Fremont - March 14, 1975 - 1:00-5:00 p.m.

January 30, 1975

Dear

The dates for administering the materials for the Pesticide Training Project are rapidly approaching. As far as I can tell we are on schedule in the preparation of materials and should be ready to go on the previously announced dates.

Enclosed with this letter is a sample letter you may want to send to the participants from your county. You may use the letter or revise it as you wish. The letter describes the project briefly and also reminds the participant of the date, location, etc. I hope it will be of some use.

Also for the participants to be reimbursed, they will need to provide us with their name, address, social security number and mileage. I am enclosing a form to record this information either prior to or during the session.

We will pay $20.00 for approximately four hours of their time plus 16¢ a mile for mileage. I estimated an average of 40 miles round trip per individual. Of course, I realize some may live much further than 20 miles, but I believe that it will average out, so don't be too concerned about the mileage. Also if you wish to invite 22 or 23 farmers so that we can be assured of at least 20, we should have enough money to cover several extra participants.

I would like to provide coffee and rolls or donuts about the middle of the session. We can also pay for this from project funds. I would appreciate it if you would also make these arrangements.

The physical arrangements that will be needed for the training sessions are as follows:

A. Group Session

We will need a room that will accomodate 20-25 people at tables for a short introduction to the project. A table at the front of the room with a podium would be desirable, but not necessary. Either tables or lap boards are necessary at this first session because they will be writing part of this time.

B. Individualized Sessions

1. Conventional Reading Material (five participants)

   a. a small room or corner of large room

   b. three tables, each large enough for two persons

   c. five chairs

   d. no electrical outlets needed

2. Audio Assisted Programmed Instructional Material (five participants)

   a. small room or corner of large room

   b. three tables, each large enough for two persons

   c. five chairs

   d. electrical outlets for five tape recordars (We will provide extension cords and cube taps)

   e. we will provide head phones for each participant

3. Printed Program Instructional Material (five participants)

   a. small room or corner of large room

   b. three tables, each large enough for two persons.

   c. five chairs

   d. no electrical outlets needed

4. Synchronized Slide-Tape Instructional Material (five participants)

   a. small room or corner of large room

   b. five tables, one person to each table, rectangular table preferred

   c. five chairs

   d. electrical outlets for five carousel projectors and five tape-synchronizers (we will provide extension cords and cube taps) Projectors are 300 watts and synchronizers are 50 watts.

   e. we will provide Head phones for each participant

We will bring all the training materials from Lincoln.

I would like to remind you that our project was approved only for private applicators and specifically farmers. I believe I have discussed this with you.

A day or two prior to the session in your county, I will call you and discuss any last minute details at that time. Please call me if this letter needs any clarification.

Sincerely,

Robert J. Florell
State Leader
Studies and Training

Enclosure

COUNTY STATIONARY

Sample Letter

January 30, 1975

Dear

Thank you for agreeing to participate in the University of Nebraska Pesticide Training Project.

As you know, by the time planting begins in 1977, anyone who uses restricted-use pesticides either as a commercial or private applicator will have to be certified by the State Department of Agriculture.

The standards for this certification will be based on the regulations of the Environmental Protection Agency. Following these federal regulations, the State Department of Agriculture will administer examinations to certify that each applicant will have the practical knowledge of these EPA regulations. In Nebraska, certification will be based on the results of a written test.

The purpose of the Nebraska Pesticide Training is to test four methods of individualized instructional material. The results of this training project will assist the Nebraska Cooperative Extension Service in deciding the best way to train farmers for certification requirements.

I would like to remind you that the date of the training session in _____ is _____ from _____ to _____ in _____.
town-location date p.m. p.m. building-location

As you were advised earlier, you will be paid $5.00 per hour during the training session, plus your round trip mileage from home. The University will need your name, address, social security number and round trip mileage before the check can be sent to you.

If for any unforeseen reason you will not be able to participate, please advise me as soon as possible.

Sincerely,

UNIVERSITY OF NEBRASKA
COOPERATIVE EXTENSION SERVICE
PESTICIDE TRAINING PROJECT

Location _____

rticipant Information Needed for Reimbursement

Name	Address	Social Security Number	Round Trip Mileage

245.

244

APPENDIX F

Demographic Data Form

PESTICIDE TRAINING PROJECT

County_____ Testing Location _____ Methodology_____

DATA SHEET

Please circle the code corresponding to the information which applies to you.

COUNTY

01 - Adams
02 - Antelope
03 - Arthur
04 - Banner
05 - Blaine
06 - Boone
07 - Box Butte
08 - Boyd
09 - Brown
10 - Buffalo
11 - Burt
12 - Butler
13 - Cass
14 - Ceda
15 - Chase
16 - Cherry
17 - Cheyenne
18 - Clay
19 - Colfax
20 - Cuming
21 - Custer
22 - Dakota
23 - Dawes
24 - Dawson
25 - Deuel
26 - Dixon
27 - Dodge
28 - Douglas
29 - Dundy
30 - Fillmore
31 - Franklin
32 - Frontier
33 - Furnas
34 - Gage
35 - Garden
36 - Garfield
37 - Gosper
38 - Grant
39 - Greeley
40 - Hall
41 - Hamilton
42 - Harlan
43 - Hayes
44 - Hitchcock
45 - Holt
46 - Hooker
47 - Howard
48 - Jefferson
49 - Johnson
50 - Kearney
51 - Keith
52 - Keya Paha
53 - Kimball
54 - Knox
55 - Lancaster
56 - Lincoln
57 - Logan
58 - Loup
59 - McPherson
60 - Madison
61 - Merrick
62 - Morrill
63 - Nance
64 - Nemaha
65 - Nicholls
66 - Otoe
67 - Pawnee
68 - Perkins
69 - Phelps
70 - Pierce
71 - Platte
72 - Polk
73 - Red Willow
74 - Richardson
75 - Rock
76 - Saline
77 - Sarpy
78 - Saunders
79 - Scotts Bluff
80 - Seward
81 - Sheridan
82 - Sherman
83 - Sioux
84 - Stanton
85 - Thayer
86 - Thomas
87 - Thurston
88 - Valley
89 - Washington
90 - Wayne
91 - Webster
92 - Wheeler
93 - York

NUMBER OF YEARS IN FARMING

01 - Less than 2 years
02 - 2-5 years
03 - 6-10 years
04 - 11-15 years
05 - 16-20 years
06 - 21 or more years

AGE OF PARTICIPANT

01 - Under 20
02 - 20-29
03 - 30-39
04 - 40-49
05 - 50-59
06 - 60 and over

LEVEL OF EDUCATION COMPLETED

01 - 8th grade and less
02 - 9-11th grade
03 - High school graduate
04 - Trade, business or technical school
05 - Some college (1-3 years)
06 - College graduate with degree
07 - College 4 years without degree
08 - Graduate degree (Masters or doctorate)

PREVIOUS TRAINING IN USE OF PESTICIDES - SOURCES OF INFORMATION

01 - Periodical (farming magazine or newspaper)
02 - Dealers
03 - County agent
04 - Vo-ag training
05 - Radio
06 - Television
07 - Other _____

ACRES UNDER PRODUCTION

01 - Less than 50
02 - 50-99
03 - 100-499
04 - 500-999
05 - 1,000-4,999
06 - 5,000-9,999
07 - 10,000 or more

TYPE OF EQUIPMENT USED

01 - Sprayer
02 - Fogger
03 -
04 - Granular spreader
05 - Low pressure sprayer
06 - High pressure sprayer
07 - Air blast or mist sprayer

USED PESTICIDES BEFORE

01 - Fewer than 50 acres
02 - 50-99 acres
03 - 100-499 acres
04 - 500-999 acres
05 - 1,000-4,999 acres
06 - 5,000 acres or more
07 - No

PLAN ON USING PESTICIDES IN THE FUTURE

00 - No response
01 - Yes
02 - Undecided
03 - No

ARE YOU FAMILIAR WITH THE EPA REGULATIONS?

00 - No response
01 - Yes
02 - Undecided
03 - No

SHOULD PRIVATE APPLICATORS HAVE TO BE CERTIFIED?

00 - No response
01 - Yes
02 - Undecided
03 - No

Comments: _____

_____

IS PESTICIDE USAGE WARRANTED?

00 - No response
01 - Yes
02 - Undecided
03 - No

DO YOU CONSIDER IT ADVISABLE TO RESTRICT USE OF CERTAIN PESTICIDES?

00 - No response
01 - Yes
02 - Undecided
03 - No

Comments: _____

_____

APPENDIX G

Attitude Scale
PESTICIDE TRAINING PROJECT

County _____ Testing Location _____ Methodology _____

This scale has been prepared so that you can indicate how you feel about this training session. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction, as follows:

SA if you strongly agree with the statement
A if you agree but not strongly so
N if you are neutral or undecided
D if you disagree but not strongly so
SD if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents how you feel about this training session.

1. I am satisfied with the methods used in teaching this training session. . . . . SA A N D SD

2. My attitude toward this training session is less favorable than it was before the session. . . . . SA A N D SD

3. There was not enough contact between teacher and participants in this training session . . . . . SD D N A SA

4. I like the teaching method used in this training session . . . . . SA A N D SD

5. Too much emphasis has been placed on topics that are unimportant . . . . . SA A N D SD

6. I cannot see that this teaching method has an advantage over any other methods. . . . . SD D N A SA

7. Every expectation I had for this training session has been exceeded . . . . . SA A N D SD

8. The method for teaching this training session is better for some participants than for others. . . . . SD D N A SA

9. I have neutral feelings toward the subject matter in this training session . . . . . SD D N A SA

10. The presentation of this training session is paced too fast. . . . . SA A N D SD

11. I am pleased with the teaching method used for this training session. . . . . SA A N D SD

12. I am disappointed with this training session. . . . . SD D N A SA

13. I find it easy to learn the material presented because I am really enthusiastic about it . . . . . SD D N A SA

14. I am forced by the method used in this training session to spend too much time on material I already know. . . . . SA A N D SD

15. I feel that all training sessions should be taught by the method used in this training session . . . . . SA A N D SD

16. Applicants do not participate enough in this class. . SD D N A SA

17. The method used to teach this training session delays our progress through the material . . . . . SA A N D SD

18. I remember the material in this training session because of the method used to present it. . . . . SD D N A SA

19. I did not think I would learn as much in this training session as I have . . . . . SA A N D SD

20. Because of the teaching method used in this training session, I can't do as much on my own as I want to do SA A N D SD

21. I am enthusiastic about the way this training session is taught . . . . . SD D N A SA

22. The method of instruction in this training session leaves a lot to be desired. . . . . SD D N A SA

23. The subject matter in this training session is well organized . . . . . SA A N D SD

24. This training session is not as good as I hoped it would be. . . . . SA A N D SD

25. In this training session I did not have a chance to go back over the material . . . . . SD D N A SA

26. I find the content of this training session interesting . . . . . SA A N D SD

27. The method of teaching this training session was clear and to the point. . . . . SA A N D SD

28. The material that was presented in the training session is important to me in my work . . . . . SD D N A SA

29. The material presented was new and informative. . . . SD D N A SA

30. I expected to be able to use the information given in this training session extensively. . . . . SA A N D SD

31. The method of presentation in this training session stimulated my attention . . . . . SD D N A SA

32. I feel that I was well informed in basic aspects of the material in this training session . . . . . SD D N A SA

33. The material presented in this training session was appropriate and useful for my occupation. . . . . SA A N D SD

34. The method of teaching the material in this training session was appropriate and helpful to me . . . . . SA A N D SD

35. I would rather have a variety of methods of teaching to learn the material presented in this training session . . . . . SD D N A SA

36. How do you feel about learning by this method?

_____

_____

_____

37. Would you have preferred studying from one of the other methods used today? If so, which one and why?

_____

_____

_____

_____

APPENDIX H

Pesticide Knowledge Test

Directions: On the IBM answer sheet, darken the appropriate space, as in this example:

The largest city in the Midwest is:

a. Minneapolis
b. Omaha
c. Chicago
d. St. Louis

A	B	C	D	E
===	===	■■■	===	===

1. Containers which held mercury, lead, cadmium, or inorganic pesticides should be

   a. burned if local laws permit
   b. crushed and stored for later legal disposal
   c. buried at least 36 inches deep away from water sources
   d. stored indefinitely in a locked building

2. Which of the following information does <u>not</u> have to appear on pesticide labels?

   a. Keep Out of Reach of Children
   b. EPA Registration Number
   c. Shake Well Before Using
   d. Manufacturer's Name and Address

3. Light green with a narrow darker green stripe down the center of the back is a description of

   a. greenbugs
   b. aphids
   c. European corn borers
   d. corn rootworms

4. The signal word for pesticides which belong to the category of relatively non-toxic is

   a. WARNING
   b. CAUTION
   c. DANGER
   d. None of the above

5. Immense populations of greenbugs develop due to their ability to mature rapidly and reproduce in about

   a. 7 days
   b. 10 days
   c. 14 days
   d. 21 days

6. The first step in calibrating sprayers is

a. to measure length of boom
b. to fill tank with water
c. to clean equipment
d. to measure capacity of tank

7. The following symptoms may be signs of which kind of poisoning--nausea, diarrhea, excessive saliva?

a. mild poisoning
b. moderate poisoning
c. mild poisoning or early acute poisoning
d. moderate poisoning or early acute poisoning

8. Adding one of the following to surplus pesticide tank mix helps break the chemical down quickly.

a. peroxide
b. lime
c. salt
d. detergent

9. The best method for changing delivery rates of a sprayer is

a. to change the discs in the nozzles
b. to change the pump pressure
c. to change the amount of formulation in the tank
d. to change the speed of the sprayer

10. Pesticides which are classified as moderately toxic must have which of these signal words on the label?

a. CAUTION
b. WARNING
c. DANGER
d. None required

11. Black cutworm larvae attack plants

a. in the whorls
b. in the silks
c. above soil line
d. below soil line

12. To counteract the effects of poison in the eye, wash the eye with clean, running water for at least

a. 5 minutes
b. 8 minutes
c. 12 minutes
d. 15 minutes

13. Factors which cause pesticides to move off-target include

a. wind
b. rain and runoff
c. vapor drift
d. all of the above

14. A chemical which is effective only when cutworms are 1/2 inch long or less is

a. Lindane
b. Sevin 5%
c. Sevin 80 WP
d. Heptachlor

15. The type of pesticide which is most likely to cause harm to wildlife is

a. accumulative pesticides
b. non-accumulative pesticides
c. persistent pesticides
d. none of the above

16. Adult corn borers are described as

a. dark larvae
b. light colored larvae
c. buff-colored moths
d. dark-colored moths

17. When calibrating granular applicators, _____ feet is a logical distance to travel before collecting granules from the delivery tubes.

a. 100
b. 500
c. 1000
d. 2,722

18. The first consideration in handling pesticides safely is

a. to plan ahead
b. to avoid exposure
c. to mix with caution
d. to choose the correct formulation

19. Hazard to plants by pesticide application is most likely to be caused by

a. type of pesticides
b. dosage of pesticides
c. persistence of pesticides
d. movement of pesticides

20. A pesticide is

a. an agent used to destroy weeds
b. an agent used to destroy insects
c. an agent used to destroy plant diseases
d. all of the above

21. A chemical effective for controlling cutworms <u>at</u> plant is

a. Aldrin (1 lb/acre)
b. Aldrin (2 lbs/acre)
c. Chlordane (1 lb/ acre)
d. Chlordane (4 lbs/acre)

22. To induce vomiting, first

a. give patient large amounts of milk or water
b. put your finger at back of patient's throat
c. collect some vomitus
d. make sure patient is kneeling forward or lying face down

23. First brood corn borers cause damage described as a

a. worm-hole appearance
b. shot-hole appearance
c. ragged chewing appearance
d. stripping appearance

24. The following symptoms are signs of which kind of poisoning--pinpoint pupils, convulsions?

a. mild poisoning
b. moderate poisoning
c. acute poisoning
d. all of the above

25. The second brood of European corn borers overwinter in Nebraska by

a. hibernating in the soil
b. hibernating in infested ears
c. hibernating in infested stalks
d. hibernating in decaying material

26. Pesticides which give safest long term control are classed as

a. persistent
b. accumulative
c. non-accumulative
d. none of the above

27. Chronic poisoning is indicated by symptoms of

a. headaches
b. loss of appetite
c. irritability
d. all of the above

28. Extensive silk damage at pollination is caused by

a. cutworms
b. corn rootworms
c. corn borers
d. corn root aphids

29. Plant injury by misuse of pesticides is called

a. phototoxicity
b. phytotoxicity
c. hypotoxicity
d. hypertoxicity

30. The way <u>not</u> to dispose of a container that held 2,4-D type weed killer is to

a. bury it
b. store it in a locked 55-gallon drum
c. burn it
d. crush and store in a restricted area

Appendix I

Revised February 12, 1975

SCHEDULE FOR ADMINISTERING INSTRUCTIONAL MATERIALS FOR PESTICIDE TRAINING PROJECT

Note Change in Schedule

Robert M. Voboril - Platte County - Columbus - February 18, 1975 - 1:00-5:00 p.m.

Donald C. Spitze - Wayne County - Wayne - February 19, 1975, 10:30-3:30 p.m.

William R. Pedersen - Custer County - Broken Bow - February 24, 1975 - 1:00-5:00 p.m.

Monte D. Hendricks - Scotts Bluff County - Scottsbluff - February 26, 1975 - 1:00-5:00 p.m.

A. Neil Dawes - Jefferson County - Fairbury - February 28, 1975 - 1:00-5:00 p.m.

Robert G. Wilson - Nemaha County - Auburn - March 7, 1975, 1:00-5:00 p.m.

Paul L. Swanson - Adams County - Hastings - March 11, 1975 - 1:00-5:00 p.m.

Robert N. Klein - Red Willow County - McCook - March 12, 1975 - 1:00-5:00 p.m.

Fred M. Schmidt - Keith County - Ogallala - March 13, 1975 - 10:00-3:00

James E. Novotny - Dodge County - Fremont - March 14, 1975 - 1:00-5:00 p.m.

Appendix J

PESTICIDE TRAINING PROJECT

Checklist of Materials and Equipment Needed at Each County Location

Location _____

Date _____

1. Opening remarks (transparencies) ____
2. Two expense blanks ____
3. Twenty demographic data forms ____
4. Twenty #2 lead pencils ____
5. Twenty knowledge examinations ____
6. Twenty answer sheets ____
7. Twenty attitude scales ____

Individualized Instructional Materials

1. Ten booklets - Conventional reading materials ____
2. Five booklets - Printed programmed instruction ____
3. Five latent image developers ____
4. Five audio assisted workbooks ____
5. Five sets of cassette tapes for audio assisted instruction ____
6. Five tape recorders ____
7. Ten head phones ____
8. One pad of lined paper (divide between slide-tape instruction and conventional materials) ____
9. Five carousel projectors ____
10. Five slide-tape synchronizers ____
11. Five rear view projection screens ____
12. Twenty-five trays of slides ____
13. Five sets of cassette tapes for slide-tape instruction ____
14. Extra bulbs for projectors ____

Miscellaneous

1. Pencil sharpener ____
2. Four cardboard dividers ____
3. Ten extension cords ____
4. Ten cube taps ____
5. Ten electric plug adapters ____
6. Twenty-five cups of coffee ____
7. Twenty-five doughnuts or rolls ____
8. Standards for Certification of Pesticide Applicators ____
9. Two charts ____
10. Pictures in back cover of audio assisted workbook ____
11. Alcohol for sanitizing ear plugs ____
12. Time record ____
13. Instructions for participants ____

APPENDIX K

Instructions and Communications to Participants

PESTICIDE TRAINING PROJECT

February and March, 1975

Welcome to the Pesticide Training Project. We appreciate your participation and hope that you will find it interesting and worthwhile.

INTRODUCTIONS

BIOGRAPHICAL DATA FORMS (PASS OUT THE DATA FORMS AND ASK PARTICIPANTS TO COMPLETE)

PL 92-615. Also pass out pencils.

In 1972, the U.S. Congress passed Public Law 92-516 which is commonly known as the Federal Insecticide, Fungicide and Rodenticide Act. The passage of this act and its effect on the use of restricted pesticides is the reason we are here today. This federal law requires states to pass enabling legislation that sets certification standards for any private or commercial applicator who applies restricted pesticides after October 21, 1976. In general, this will take effect during the 1977 crop season because it appears now that crop pesticides are more likely to be restricted than pesticides used on animals. The law states that a written or oral testing procedure, or such other equivalent system may be approved as a part of a state plan. (PASS OUT THE STANDARDS FOR CERTIFICATION OR PRIVATE APPLICATORS. REFER TO PAGE 15, SECTION 171.5. REVIEW THIS SECTION WITH PARTICIPANTS.)

LB 332

The enabling legislation has not been passed in Nebraska, so we don't know for sure what the requirements will be.

LB 332 has been introduced in the Nebraska Legislature and will be considered during this session of the legislature. It will require applicators of restricted

pesticides to be certified in some manner. It may be an oral examination, a written examination or a statement of some kind. Likely, it will be a written test.

The Nebraska Pesticide Training Project

One of the Federal Agencies that is involved with the provisions of PL 92-516 is the U. S. Environmental Protection Agency. This agency is responsible for assisting states implement their pesticide certification programs. State certification plans must be approved by the EPA.

One means of assisting states is to provide funding for various types of projects. The Nebraska Cooperative Extension Service received a training grant during the past year to develop and test pesticide training materials. Our purpose today is to obtain information from you in regard to these training materials.

The Nebraska Pesticide Training Project has two primary objectives:

1. To develop instructional pesticide materials that can be used to train farmers for certification after the project is completed.

2. To determine methods of presenting this material in a form that an individual can study prior to taking a test for certification.

The material that we have developed will be tested at ten different locations in Nebraska including _____ with 200 farmers
(name this location)
participating. We will ask you to study the material using one of four methods of individualized instruction. We are interested in the learning that takes place as well as how you feel about the method.

The following topics were used to prepare the materials. The topics were taken from the federal law:

Unit I INSECTS DISTRUCTIVE TO CORN AND SORGHUM
Unit II LABEL READING
Unit III CALIBRATION
Unit IV ENVIRONMENTAL CONSIDERATIONS
Unit V BASIC SAFETY

(SHOW PRINTED CHART)

The subject matter in these four units was prepared in four different methods of individualized instruction. You will be assigned to one of these methods today. They are:

1. CONVENTIONAL READING MATERIALS
2. PRINTED PROGRAMMED INSTRUCTION
3. AUDIO-ASSISTED PROGRAMMED INSTRUCTION
4. SYNCHRONIZED SLIDE-TAPE INSTRUCTION

(SHOW PRINTED CHART)

Procedure

1. ASSIGN METHODOLOGY BY RANDOM COUNT ONE THROUGH FOUR.
2. ASSIGN PARTICIPANT NUMBER COUNTING FROM NUMBER FIVE.
3. RECORD METHODOLOGY NUMBER AND PARTICIPANT NUMBER AT TOP OF DATA SHEET AND HAND IN COMPLETED SHEET.
4. PASS OUT INSTRUCTIONS FOR PARTICIPANTS AND ASK THEM TO RECORD METHODOLOGY NUMBER AND PARTICIPANT NUMBER IN SPACE PROVIDED.
5. Remind them that it will take from one to three hours to study the material depending on method and their own study habits.
6. Remind them coffee and rolls are available at their convenience.
7. Divide into study groups. Instructions to be given as follows:
   a. Conventional Reading Material - none
   b. Printed Programmed Instruction - County Agent
   c. Audio-assisted Programmed Instruction - Florell or Roselle (remind them that there ~~is~~ are about 100 minutes of tape)
   d. Synchronized Slide Tape - Koinzan
8. Record starting time for individualized instruction.
9. Record ending time and participant number with appropriate methodology.
10. After studying materials, administer opinion scale first -- be sure county, testing location, methodology number and participant number is recorded when scale is returned.
11. Administer knowledge test -- be sure county, testing location, methodology number and participant number ~~is~~ are recorded when scale is returned.

12. Advise county agent to send participant list including name, address and mileage and any refreshment or building rental costs to R. Florell.

13. Check to see if each participant has completed three instruments with methodology number and participant number on all three.

NEBRASKA PESTICIDE TRAINING PROJECT

Instructions for Arranging Testing Situation

Room Arrangement

Responsibility - Florell or Roselle and County Agent

1. Examples of previous arrangements.
2. Requires about 13 tables.

Methodologies

1. Conventional Reading Materials (requires two tables, five chairs):

   Responsibility - Florell or Roselle

   a. five conventional reading booklets
   b. two sheets of paper for each participant

2. Printed Programmed Instruction (requires two tables, five chairs).

   Responsibility - Florell or Roselle

   a. distribute five conventional reading booklets
   b. distribute five printed programmed instruction booklets
   c. distribute five latent image developers

3. Audio-assisted Programmed Instruction (requires two tables, five chairs).

   Responsibility - Florell or Roselle

   a. distribute five audio-assisted programmed instruction booklets (check picture in back of each book)
   b. set up tape recorders
   c. sanitize ear plugs
   d. set tapes at starting position

4. Synchronized Slide Tape (requires three tables, five chairs).

   Responsibility - Koinzan

Appendix L

Compilation of Participants' Responses to

Attitidinal Items on Demographic Data Form and Attitude Scale

Item	No. of Responses[a]	Response Categories
"Should private applicators have to be certified?"	15 favorable	Prevent misuse; protect safety of the applicator; restrict to very toxic chemicals; animal applications should be excepted.
	22 unfavorable	Commercial applicators only; restricted pesticides only; increase cost to producer; provide training regarding legal limitations and hazards without need for licensing.
	2 neutral	Want to know requirements.
"Do you consider it advisable to restrict use of certain pesticides?"	36 favorable	Carelessness by applicator; high toxicity of some chemicals; animal applications should be excepted.
	5 unfavorable	Cost will prevent use beyond requirements; commercial applications only.

[a]Favorable responses were determined as those given along with the coded answer "Yes" to an attitudinal item. Unfavorable responses were determined as those accompanying the coded answer "No" to an attitudinal item.

Appendix L

Compilation of Participants' Responses to

Additional Items on Demographic Data Form and Attitude Scale

Item	IDS[a]	No. of Responses	Reasons
"How do you feel about learning by this method?"	CR	29 favorable	Self-pacing; less expensive and complicated; can be studied at home.
		6 favorable with noted exception.	Some technical material difficult to retain by reading a one.
		2 neutral	
		6 unfavorable	No external stimulus; routine information available elsewhere. No emphasis on more important facts; too much distraction in study area.
	PP	34 favorable	Self-pacing; practical in terms of cost of materials and equipment, space and facilities required; time-saving for learning.
		10 favorable with noted exception	More visual stimulus needed; general information should be presented first; some questions unnecessary.
		3 unfavorable	Limiting in material presented; not helpful for memory retention.

[a]IDS = instructional delivery systems; CR = Conventional Reading; PP = Printed Programmed; AA = Audio Assisted; and ST = Slide-Tape.

Appendix L

Compilation of Participants' Responses to

Attitudinal Items on Demographic Data Form and Attitude Scale

Item	IDS[a]	No. of Responses	Reasons
"How do you feel about learning by this method?"	AA	19 favorable	Self-pacing; rovides review; holds attention; hearing and reading together aid retention of facts.
		13 favorable with noted exceptions.	Time-consuming; hard to concentrate at first; time needed to become oriented to method; illustrations would be helpful.
		1 neutral	
		15 unfavorable	Too long; hard to concentrate for length of time; much information already common knowledge.
	ST	28 favorable	Sight and sound aid retention of facts; holds interest; effective, rapid presentation of information.
		18 favorable with noted exception	Printed review material needed; moved too quickly through pre entation; not able to review; not enough extensive coverage.
		1 neutral	
		1 unfavorable	Expensive and time consuming.

[a]IDS = instructional delivery systems; CR = Conventional Reading; PP = Printed Programed; AA = Audio Assisted; and ST = Slide-Tape.

Appendix L

Compilation of Participants' Responses to

Attitudinal Items on Demographic Data Form and Attitude Scale

Item	Method[a] Used	Method[a] Preferred	Number Participants	Reasons
"Would you have preferred studying from one of the other methods used today? If so, which one and why?	CR	CR	6	No reasons given.
	CR	CR	4	Provides review at home; less expensive and time-consuming.
	CR	PP	1	Conventional reading and printed programed practical for state-wide instruction.
	CR	AA	2	Enhances learning; cuts down on distractions.
	CR	ST	13	Attention held better; easier to comprehend and remember material.
	CR	All or any other one.	11	More diversity provided; different deliveries suitable for different people; uriosity.
	CR	Undecided	2	

[a]Methodologies used were CR = Conventional Reading; PP = Printed Programed; AA = Audio Assisted; and ST = Slide-Tape.

Appendix L

Compilation of Participants' Responses to

Attitudinal Items on Demographic Data Form and Attitude Scale

Item	Method[a] Used	Method[a] Preferred	Number Participants	Reasons
"Would you have preferred studying from one of the other methods used today?	PP	PP	14	No reason given.
	PP	PP	5	Concise method; effective for learning.
	PP	CR	1	Reading first gives clear overall picture.
	PP	AA or ST	3	More specific; visual and audio aids enhance learning.
	PP	ST	14	Less time-consuming; better retention of material; curiosity.
	PP	Undecided or Neutral	5	Must try other methods first.
	AA	AA	6	No reason given.
	AA	AA	7	Good study method; very informative.
	AA	CR	3	Self-pacing; reading with live instruction.

[a]Methodologies used were CR = Conventional Reading; PP = Printed Programed; AA = Audio [illegible], and ST = Slide-Tape.

Appendix L

Compilation of Participants' Responses to

Attitudinal Items on Demographic Data Form and Attitude Scale

Item	Method[a] Used	Method[a] Preferred	Number Participants	Reasons
"Would you have preferred studying from one of the other methods used today? If so, which one and why?"	AA	PP	2	No reasons given.
	AA	ST	16	Easier to follow; better retention of facts; visuality enhances learning.
	AA	Any one	2	Others just as effective and faster.
	AA	Undecided or Neutral	7	
	ST	ST	23	No reasons given.
	ST	ST	13	Not boring; requires minimum of effort from learner.
	ST	CR	3	Provides review material; prefer reading to learn.
	ST	AA	1	No reason given.
	ST	All	1	Try all first to decide on one.
	ST	Undecided or Neutral	2	Not familiar with others.

[a]Methodologies used were CR = Conventional Reading; PP = Printed Programed; AA = Audio

Appendix M
Debriefing Letter to Participants

COOPERATIVE EXTENSION SERVICE

UNIVERSITY OF NEBRASKA–LINCOLN LINCOLN, NE 68503

Institute of Agriculture and Natural Resources

Reply to:
_____ Agricultural Hall
East Campus

April, 1975

Dear

Thank you for your participation in the Nebraska Pesticide Training Project. We appreciate the fine cooperation that we had from over 200 farmers at ten locations in Nebraska.

Payment is enclosed for participating and also for the mileage you submitted. We based the payment on $20.00 per participant, plus mileage. If the amount of your check is not correct, please advise your county agent.

I am also enclosing a copy of the test you completed and an answer sheet. The scores for all the participants in the state ranged from 10 to 28, with an average score of 19.

We'll send you a copy of the final report when it is completed about July 1.

Sincerely,

Robert J. Florell
State Leader, Studies and Training
Nebraska Pesticide Training Project, Director

Enclosures

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EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO."
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE

The University of Nebraska-Lincoln The University of Nebraska Medical Center The University of Nebraska at Omaha

Appendix N

Debriefing Form to County Extension Agents

COOPERATIVE EXTENSION SERVICE

UNIVERSITY OF NEBRASKA–LINCOLN LINCOLN, NE 68503

Institute of Agriculture and Natural Resources

Reply to:
_____ Agricultural Hall
East Campus

April 18, 1975

The information that was collected for the Pesticide Training Project is being analyzed. We should have preliminary results before too long. The final report will be written by July 1. We had a total of 203 farmers participate in the project.

Thank you for your efforts to insure the success of this project. Your cooperation, interest and local arrangements were excellent. Without this support, it would have been impossible to conduct the project. Hopefully, the materials that were developed will be useful for further training of private applicators.

As we proceed to writing the report, we would like to include your thoughts about the project. Please complete the enclosed questionnaire and return it to me at your earliest convenience.

The participant's check, the enclosed letter and the test questions have been mailed to each participant. We do plan to send them the final report later.

We will also plan to send you a copy of the final report.

Sincerely,

Robert J. Florell
State Leader
Studies and Training

Enclosures

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EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO," THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES, UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE

The University of Nebraska-Lincoln The University of Nebraska Medical Center The University of Nebraska at Omaha

AGRICULTURAL EXTENSION AGENTS EPA TRAINING

PROJECT FEEDBACK FORM

A. Please evaluate the following aspects of the EPA pesticide training program you hosted by circling the appropriate number: Your opinion.

	Superior	Excellent	Good	Fair	Poor
1. Overall Program	1	2	3	4	5
2. Organization of Presentation	1	2	3	4	5
3. Quality of Materials	1	2	3	4	5
4. Participant Satisfaction	1	2	3	4	5
5. Quality of Learning Experience	1	2	3	4	5

B. Now that the pesticide training sessions have been completed, what comments have you received from the participating farmers?

_____

_____

_____

C. Which of the four methods that were tested in this project would be the most useful to you for training pesticide applicators?

Conventional Reading Materials _____
Printed Programmed Instructions _____
Audio-Assisted Programmed Instructions _____
Synchronized Slide Tape Instructions _____

How might you use this method(s) for training pesticide applicators?

_____

_____

_____

D. Other Comments:

_____

_____

_____